ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXIII, No. 12. CHICAGO, SATURDAY, SEPTEMBER 20, 1913. ISSUED WEEKLY.

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY
608 SOUTH DEARBORN STREET
CHICAGO

Charles W. Price, President and Treasurer.
A. A. Gray, General Manager. H. S. Tuthill, Business Manager.
J. B. McCarthy, Asst. Gen. Mgr. C. W. Forbrich, Asst. Bus. Mgr.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.
J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.
C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich.....Associate Editor
J. E. Latta.....Associate Editor

SUBSCRIPTIONS.

One Year, United States.....$3.00
One Year, Canada..... 4.00
One Year, Foreign Countries..... 6.00
Single Copy, 10 cents. Back numbers, beyond one month, each .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

CONTENTS.

EDITORIALS:
The Storage of Coal 553
Enthusiasm for the Work 554
The Importance of Magnetic Quality 554
Public Park and Boulevard Lighting in a Large City.....555
DEPARTMENTS:
Commercial Practice 565
Electrical Construction 567
Dollar Wiring Kinks 573
Among the Supply Men.....574
Public Service Commissions 575
New Electrical and Mechanical Appliances.....589
Latest Approved Fittings 592
Current Electrical News 593
Record of Electrical Patents 599
LEADING ARTICLES:
Electricity in Automobile Manufacturing—I.....559
The Wiring in a Modern Storage-Battery Plant.—By H. G. Wilson 567
Park and Boulevard Lighting in Chicago.....577
American Electrochemical Society 583
LETTER TO THE EDITOR:
Catalog Designations.—By Ed. Raetz 576
BOOK REVIEWS 588
MISCELLANEOUS:
Boston Vehicle Club Resumes Meetings.....556
E. F. Roeber 557
Empire State Meeting 557
Railway Convention to be Held at Atlantic City.....557
Texas Jovians Celebrate 558
Meeting of International Illumination Commission.....558
Association of Edison Illuminating Companies Convention.558
Neighborhood Merchandising 565
Electric Vehicle Meeting 565
Time-Keeping and Meter Records.—By J. B. Linker.....566
Power-Factor Simply Defined 568
Among the Contractors 569
Some Good Conduit Work 570
Keeping Check on the Interruptions of Service.—By John G. Montgomery 570
Improved Testing Set.—By M. J. Morriarty 571
Formation and Growth of the National Electrical Contractors' Association 571
Electrical Supply Jobbers Meet at Niagara Falls.....574
The Society for Electrical Development: Its Place, Its Object and Its Benefits.—By Stephen L. Coles.....586
The Hot Springs Fire 586
Spontaneous Combustion of Coal 587

Copyright, 1913, by the Electrical Review Publishing Company.

THE STORAGE OF COAL.

Most central stations find it desirable to store a certain quantity of coal. This is necessary to tide them over periods when the supply is not regular, due either to shutdown of the mines or interruption to transportation through railroad strikes or other causes. The amount of coal to be stored is a question which must be determined by local conditions of supply, but the method of storage should be guided by conditions and principles which are of general application.

The principal difficulty which has arisen in connection with coal storage is that of spontaneous ignition. A paper dealing with this subject which was presented early in the year at a meeting of British engineers is abstracted in this issue, and the conclusions reached by the author are worthy of careful consideration, especially inasmuch as they are in general conformity with the results of an investigation carried out by the Bureau of Mines in this country.

The author of the paper, Mr. Kendrick, concludes that storage piles in the open air should not exceed 16 to 20 feet in height and should not be placed where subjected to external sources of heat. The lumps and fine dust should be well mixed so as to avoid as far as possible air spaces in the heap. Stacking under cover is preferable to stacking in the open air, since the intermittent wetting by rain, etc., is undesirable. Temperature records should be kept in order that an incipient rise in temperature may be checked. When a fire has been discovered, care should be observed not to open up the coal by pushing in rods or otherwise, so as to admit air to the burning portion. Lots of coal from different sources should preferably not be mixed.

The recommendation by the Bureau of Mines is to limit the height of a stack to 12 feet. This may be regarded as a perfectly safe minimum and it could, probably, be increased in many cases without danger. The best height for stacking would undoubtedly depend upon the particular kind of coal used. It is well known that coal freshly mined is most subject to spontaneous ignition, and when not stored until six or eight weeks after mining this seldom or never occurs.

While some coals deteriorate slightly from exposure, there are others in which the deterioration is scarcely noticeable, so that spontaneous ignition is the principal objection to open-air storage. To avoid

this contingency, storage under water has been adopted in many places and is accompanied by little or no disadvantage. There is no deterioration of the coal under water and all possibility of spontaneous ignition is, of course, removed. In many cases it would seem feasible and advisable to keep an emergency supply of coal which would likely be stored for long periods, under water, while the regular supply, which is only stored temporarily, is left in the open. In the colder portions of the country the possibility of freezing up the supply just at the time when needed is an objection to storage under water, and it is true that in these portions of the country spontaneous ignition is much less likely to take place, since it only occurs where heat is not abstracted from the pile as fast as it is generated by the slow oxidation of the coal. For this reason some plant managers have advocated ventilation of the coal pile. This is in general not advisable, since it insures a supply of oxygen without insuring that the circulation of the air will be sufficient to keep the temperature down. Oxidation begins at ordinary temperature in any coal, but proceeds very slowly unless the heat generated is prevented from escaping. When this takes place the rate of oxidation increases rapidly as the temperature rises and if the conditions are such as to allow a temperature in the neighborhood of 100 degrees centigrade to be reached the heat will continue to be developed at a rate that will soon result in ignition. The admission of oxygen is, of course, an important point, and this is most facilitated in the case of run-of-mine coal, where the large lumps produce air spaces, and the fine pieces and dust present the large surfaces which are necessary for a considerable development of heat.

ENTHUSIASM FOR THE WORK.

Men rarely do well in a vocation or business that they do not like. By following such a vocation a man reduces his life to a continual round of drudgery. Where the pay envelope is the sole incentive to excellence the amount of money in it rarely becomes large. Employees whose efforts are inspired only by the weekly wage seldom develop into employers; they remain always in the wage-earning class. The idea of heaven as a place of perpetual, undisturbed rest ought to be sweet to such men. If temporal misery entitles one to future happiness, most men of this class certainly have large claims on paradise.

There are a number of reasons why so many who are wage earners lack interest in their work. Sometimes the employer is to blame. Where the employer shows a disposition to regard the employee as a sort of machine or tool, rather than a kind of partner in the business, it is little wonder if the employee fails sometimes to have the proper enthusiasm for his work. It may be added, moreover, that such a disposition on the part of almost any employer is an exceedingly expensive luxury. By paying a bigger price a more efficient machine can be purchased, but efficiency in men is not nearly so simply obtained. Electricians do no better work, nor any more of it per day, in towns where the wage scale is $6.00 a day than in places where but $4.00 is paid.

However, lack of enthusiasm for one's work is much too often the fault of the individual himself—it is this way in perhaps a majority of cases. Enthusiasm can be cultivated. Moreover, it is an infectious sort of thing. Reading current literature in one's special field is a way of cultivating it; it can be contracted by associating with others who have it. These simple remedies are within easy reach of every electrician who finds his interest in electrical work lagging.

Once in a while the trouble is that a man has adopted the wrong trade or profession. The hope of big earnings has induced him to become an electrical worker or a contractor, let us say, and then he finds the work or business distasteful. There is but one thing for such a man to do: quit the business as soon as he finds he cannot acquire a fondness for it.

THE IMPORTANCE OF MAGNETIC QUALITY.

Electrical development has been progressing with leaps and bounds and probably few of us realize the extent of the industry today. The figures given by Mr. Frank Vanderlip in his address at Association Island, which was reported last week, will convey some impression of its rapid growth, as measured in the capital necessary to invest in order to keep pace with industrial requirements. Its magnitude from another point of view can be indicated by the vast expenditure of energy which is made every year to supply the core losses in electrical machinery.

A writer in the *Journal of the Franklin Institute* in 1910 estimated that with energy at one-half cent per kilowatt-hour, a sum not less than $10,000,000 was expended annually at that time to supply the core losses of transformers, generators and motors. A manufacturer of sheet iron, such as is used for electrical apparatus, has recently estimated that 120,000 tons of electrical sheets are manufactured yearly, of which 25 per cent is waste, while 90,000 tons actually enter into the construction of electrical machinery. Allowing two watts per pound as expenditure for core loss and supposing the apparatus to be in operation only half the time, he computed that 1,500 million kilowatt-hours would be annually transformed into heat by this output of a single year. If energy costs one-half cent per kilowatt-hour, this represents an expenditure of $7,500,000 in the course of a year to supply the core loss of a single year's output, not to mention the accumulated stock of machinery from former years which is also in operation. Since the output of electrical machinery shows a pretty steady increase from year to year, it seems probable that

the annual outlay to supply core losses at the present time is not less than $25,000,000.

With these figures in mind, it is very evident what a great economic waste is involved in the excitation of those iron and steel parts of electrical machines in which the magnetism is continually reversed. Any improvement that can be made in the magnetic quality of this iron, even to the slightest extent, has an enormous effect upon the cost of the energy which must be wasted during the lifetime of the apparatus. Such improvements have been made from time to time, the most notable being the introduction of silicon-steel for use in transformer cores. This material has, owing to its mechanical properties and low saturation, found little application in the armatures of generators and motors, but the iron which is being used for these purposes is much superior to that in general use ten years ago. There is still room for much improvement, however, and the financial importance of progress in this art is vast enough to inspire the best endeavors of those working upon the problem.

PUBLIC PARK AND BOULEVARD LIGHTING IN A LARGE CITY.

In the growth of nearly all large cities it has been realized that the crowding of an immense population into a densely built-up area brings about many vexatious social problems that the small town or village is not troubled with. One of these is to find means to give rein to the natural play instinct in children; another is to provide for physically and morally healthful exercise and amusement for the adolescent youth; still another is to furnish facilities for recreation for the adult part of the population. The largest cities have come to recognize that these things must be provided, not only for the rich but also for the poor, and that if they are not provided the community will eventually suffer.

By the development of public parks our modern cities have found a happy solution for part or all of the needs just enumerated, depending upon the location, equipment and hours of permitted use of the parks. Many kinds of parks are to be found, ranging from mere patches of green, about which one can only stroll, to the elaborately equipped neighborhood social centers where can be found such varied facilities as playgrounds, gymnasiums, athletic fields, swimming pools, baths, boating and skating ponds, golf links, tennis courts, speedways, club rooms, assembly halls, museums, etc. The establishment of parks of the latter class represents, of course, a considerable investment. To get the largest return on this requires that the facilities so liberally provided should be available to the public not only during the day but also during at least the early hours of the evening. This involves the provision of adequate lighting so as to avoid both the non-use and misuse of the parks.

In every industrial center there is to be found a large number of young men and women who are employed during the day and through lack of pleasant home surroundings and early cultural training find time dragging on their hands when the day's toil is done. The monotony of their lives calls for companionship and amusement, and this is found too often in vicious pool rooms, saloons, dance halls, etc. From these conditions are developed low moral standards and ultimately many recruits to crime and vice. The creation of neighborhood parks and social centers in the most thickly populated districts establishes oases for the physical and moral uplift of their crowded inhabitants. The use of these playgrounds and gathering places under appropriate supervision is most needed in the evening to combat the particular conditions just cited and this calls for liberal lighting in both the open places in these parks and the buildings within them.

Every large city contains a more or less numerous element of well-to-do people, for whose welfare the community must also provide, since they furnish their proportion of the taxation. These people enjoy driving and motoring as one of their recreations or pastimes. To make this driving pleasant and safe to both motorists and pedestrians special driveways or boulevards have been set apart, which must be thoroughly lighted at night. A liberal outlay for this purpose not only makes these driveways safe but practically eliminates the need for the very powerful headlights on automobiles that have come into such general vogue and are actually a menace to both drivers and pedestrians on account of their decided glare.

On other pages of this issue will be found an illustrated article dealing with the park and boulevard lighting in the city of Chicago. That city has been well in the lead both in the liberal establishment and in the equipment of its park and boulevard system, so as to make their use available both day and night and at all times entirely safe. It is not necessary in these general comments to point out many of the particular features in this lighting system, which are well enough described in the article referred to, but it should be mentioned that, despite the fact that five distinct commissions have jurisdiction over the public park system in the city, there has been created on the whole a well co-ordinated group of parks and boulevards providing for the requirements of all classes. Plans are under way for a greater extension of this system and in this, liberal lighting is provided for. One noteworthy feature of the park and boulevard lighting is, that it is almost exclusively electrical and in the equipment of lamps and posts many praiseworthy innovations have been introduced on a large scale. While space does not permit dwelling upon the technical features, it should be noted that the lighting system has been laid out on a scale commensurate with the magnitude of the city and the equipment is modern and attractive.

Boston Vehicle Club Resumes Meetings.

The fall campaign of the Electric Motor Car Club of Boston opened on September 10, when a luncheon and meeting were held at the Boston Edison Company's building, the Club being guests of W. H. Atkins, general superintendent of the company. About seventy members were present.

Albert Weatherby for the Membership Committee reported the names of eight applicants for membership, and they were elected, as follows: P. E. Kelly, F. J. Robinson, J. L. Brown, R. B. Daggett, David A. Scott, R. T. Smith, J. C. Glendenning, Henry Baldwin. Business Secretary O. G. Draper reported the membership list to consist of 124, 101 in Class A, 9 in Class B, 14 in Class C, the three classes representing dealers and agents, users of electric automobiles, and representatives of the press, in the order named. A cup will be presented to the man who secures the most members before January 1, 1914.

D. C. Tiffany, for the Baseball Committee, recommended a plan for the formation of an electric-vehicle baseball league, to consist of four teams, of central-station men, passenger-car men, truck men, and battery men respectively. Games are to be played on alternate Saturdays during the summer. Superintendent Atkins, of the Edison Company, offers a cup to the season's winning team.

Vice-President E. S. Mansfield urged members to attend the forthcoming convention of the New England Section, National Electric Light Association, and to use every opportunity to present the electric-vehicle cause. About sixteen members planned to go to the Burlington convention.

Stephen G. Thompson, of the Public Service Corporation of New Jersey, spoke on the subject of the convention of the Electric Vehicle Association of America, to be held in Chicago in October, and outlined the scope of the program. Referring to the campaign being conducted by his company in New Jersey, Mr. Thompson stated that since starting the automobile department there the number of electric trucks has increased from 30 to 304. Though comparatively little work has been done on the pleasure-car end of the business, there are 206 vehicles of this type in the territory. The activities of which Mr. Thompson is the head are mostly along the line of personal canvas. It is considered possible to sell 4,000 trucks in the company's territory which, at a rate of 3 cents per kilowatt-hour, would yield a revenue to the central station of something like $1,400,000 annually.

President Day Baker said that the Club's purpose the coming fall is to push the pleasure car vigorously. It is probable that an exhibit of these vehicles will be held the first week in November at the Copley-Plaza Hotel in Boston, all manufacturers and agents showing their cars. An exhibition of commercial cars will doubtless be held in Boston later in the year.

Mr. Baker reported for the Legislative Committee that its work had been effective in keeping objectionable laws from being enacted by the last General Court. The coming season the various automobile organizations will work together to the same end. Mr. Baker pointed out the desirability of truck-owners joining the Motor Car Club, in that pressure may be brought to bear to secure advantages in highway construction and regulation in the state. Attention was called to an article in a recent issue of the *Boston American* which pointed out the menace of the horse as a breeder of disease and the claim that more accidents to persons are caused by horse-drawn vehicles than by automobiles. The president appointed Colonel Bailey, Albert Weatherby, F. J. Stone, L. D. Gibbs and F. D. Stidham as nominating committee of next year's officers.

R. B. Daggett, of the Commercial Truck Company of America, remarked on the conservatism of Boston in introducing electric lighting into its houses, as compared with cities of the West.

R. E. Allmart, of the Ohio Electric Car Company, remarked on the increased interest shown by central-station men in the electric vehicle over that evinced a year ago. J. C. MacKay, of the Westinghouse Electric & Manufacturing Company, also spoke.

O. G. Draper, of the Publicity Committee, outlined plans for club advertising to be conducted co-operatively by pleasure-car and truck dealers during the fall and winter. Daily newspapers will be used.

Day Baker called attention to the State Highway Commission's report in which the fact is recognized that roads are more damaged by the sharp caulks of horses than by auto-trucks.

Converse D. Marsh, of the Bates Advertising Company, New York, also joined in the discussion.

A letter was read by Frank J. Stone from the advertising manager of the *Philadelphia North American*, who told of the enhanced results and decreased expenditure brought about by co-operative advertising in that one newspaper. Formerly several newspapers were used, by agents and dealers acting individually, and the cost of the year's advertising was 16 per cent of the value of the sales of all the cars. Under the new plan, six pleasure-car dealers appropriated $1,000 each to the season's advertising, covering 50 insertions on the society page of the *North American*, the factory contributing 50 per cent of the cost.

Albert Weatherby called attention to the fact that the Boston Edison Company is a sharer in the advertising campaign here.

Registration reports of September 6 gave the following figures of electric vehicles in Massachusetts: Passenger cars, 562; trucks, 389. The gain over a year ago is 26.8 per cent and 71.3 per cent respectively.

On motion of Howard S. Knowlton a vote of thanks was tendered Mr. Atkins for his hospitality. The next meeting will be held September 24, with meetings regularly thereafter.

Illinois State Electric Convention.

The annual convention of the Illinois State Electric Association will be held at Quincy, Ill., September 24 and 25. The program for the first day is devoted almost entirely to an excursion by special steamer leaving Quincy at 8:30 a. m., for Keokuk, Iowa, to inspect the recently completed mammoth hydroelectric plant of the Mississippi River Power Company, returning to Quincy in the evening. It is planned to have a smoker and cabaret at the convention headquarters, Hotel Quincy, at 10 p. m., at which the Association members will be guests of the supply men and manufacturers' representatives. The business sessions of the convention will be two in number and will be held at the Masonic Temple, two blocks from the hotel, at 10 a. m. and 2 p. m. on Thursday. At each session there will be presentations of interesting papers and discussion thereon. The secretary of the Association is H. E. Chubbuck, Mayer Building, Peoria, Ill.

Detroit Society Meeting.

The Industrial Electrical Engineering Society held its regular semi-monthly meeting Friday evening, September 12, at the Employers' Association Hall, Detroit, Mich.

A very interesting and instructive talk was given by Albert Keith, chief electrician of the Pennsylvania Salt Manufacturing Company. The subject was entirely new to most of the members and, therefore, was of great interest. Mr. Keith is very familiar with this work, having been employed at this Salt Company for about ten years and was in a position to make the talk very interesting. A lively discussion followed the talk.

Indiana Electric Light Convention.

The Indiana Electric Light Association will hold its fifth annual convention on September 24 and 25 at the new Canoe Club, Indianapolis, Ind. A souvenir program is being published by Secretary J. V. Zartman.

E. F. Roeber.

The convention of the American Electrochemical Society, which was held last week in Denver and other nearby cities in Colorado, emphasizes the growing importance of this development of the science and application of electricity. As was pointed out by Charles P. Steinmetz at the big meeting of electrical men at Association Island the week before last, the ability to highly concentrate electrical energy has led to the development of electrochemical and electrometallurgical processes which have produced substances hitherto unavailable. Along the line of the increased and more economical production of these substances hitherto unavailable, electrochemistry and electrometallurgy are developing new resources, refining older processes and improving upon materials of construction and industrial and domestic utilization. Many problems which have eluded the research of the inventor are, through the medium of the electric furnace and through electrochemical processes, being brought to light, and it is easy to conjecture greater developments in, at the present time, unknown fields through the medium of this terrific force so skillfully and deftly controlled by enlightened electrochemical and electrometallurgical engineers.

Great as has been invention and mechanical development in this industry, it has undoubtedly seen the best opportunity for its quickening through the progressive work of the American Electrochemical Society and through the medium of the excellent technical publications devoted to that industry. In this connection no one has taken a more prominent part than E. F. Roeber, president of the American Electrochemical Society, and a journalist of widespread reputation and great ability.

E. F. Roeber,
President of the American Electrochemical Society.

Dr. Roeber was born on October 7, 1867, at Torgan, Germany. He was educated at the Gymnasium in Torga, and the universities of Jena, Halle and Berlin. From the latter he received the degree of Doctor of Philosophy in 1892. He came to the United States in 1894, and from 1899 to 1902 was associated with Carl Hering, as assistant, in consulting engineering in Philadelphia. He is one of the founders of the American Electrochemical Society and has been the editor, from its beginning in 1902, of *Electrochemical Industry*, later combined with *Iron and Steel Magazine* to form *Metallurgical and Chemical Engineering*.

Empire State Meeting.

The annual meeting of the Empire State Gas and Electric Association will be held in Engineering Societies Building, 29 West Thirty-ninth Street, New York City, on Thursday, October 2. At the morning session the president will review the work of the past year and will make some suggestions for next year. Reports of other officers and committees will be received. The plans for advertising campaigns of the National Commercial Gas Association and the Society for Electrical Development will be explained and discussed. There will be a paper on the future of Association work.

Luncheon will be served to the delegates in the banquet room of the Engineers' Club. At the close of the luncheon, addresses will be delivered by Chairman Decker of the Public Service Commission, Second District, and by Commissioner Maltbie of the Public Service Commission, First District.

The afternoon session will be devoted to the two subjects of Accident Prevention and Fire Prevention.

Accident from Kite Flying.

The second accident of the kind to occur in Massachusetts within the past few weeks was the electrocution on September 7, of a youth in Clinton, who was flying a kite, when a wire attached to the kite came in contact with a high-tension wire.

Railway Convention to be Held at Atlantic City.

The American Electric Railway Association will hold its thirty-second annual convention in Atlantic City, N. J., October 13 to 17. The preliminary announcement of its program indicates the growing attention which public service corporations are giving to the matter of relations with the public and employees.

"Profit-Sharing With Employees," "The Relation of Carriers to the Development of the Territory They Serve," "The Relief of City Congestion," "Present Tendency of Public-Service Laws and Regulations," "Valuation" and "Electric-Railway Securities From the Investor's Viewpoint," are some of the subjects which will be discussed.

Among the speakers will be Frank Hedley, vice-president of the Interborough Rapid Transit Company of New York; Paul Shoup, president of the Pacific Electric Railway Company, Los Angeles; C. S. Sergeant, vice-president of the Boston Elevated Railway Company; J. J. Burleigh, vice-president of the Public Service Corporation of New Jersey; W. F. Ham, vice-president of the Washington (D. C.) Railway and Electric Company; C. L. S. Tingley, vice-president of the American Railways Company, Philadelphia; C. N. Duffy, vice-president of The Milwaukee Electric Railway and Light Company; Richard McCulloch, vice-president of the United Railways Company of St Louis; C. W. Beall of Harris, Forbes & Company, New York; A. D. B. Van Zandt, Detroit United Railway Company; David W. Ross, vice-president of the Interborough Rapid Transit Company, New York; Frank Bergen, general counsel of the Public Service Corporation of New Jersey; C. M. Rosencrantz, general counsel of The Milwaukee Electric Railway and Light Company; and W. C. Rucker, assistant surgeon-general of the United States Bureau of Public Health.

Articulated Cars for Boston.

The Boston Elevated Railway will soon put in service 32 new cars of the "articulated" type, consisting of two 20-foot cars connected by a flexible vestibule, by which the passengers enter. The merit of this construction is in the facility with which narrow streets with sharp curves can be traversed.

Texas Jovians Celebrate.

The Jovian Leagues of Houston and Galveston, Tex., united in a celebration in the latter city on September 6.

A business meeting of the League was held in the afternoon and was followed in the early evening by a parade around the business section of the city. The parade was headed by an escort of police, followed by the Nineteenth Infantry Band; then came the candidates for initiation, each man carrying an illuminated banner depicting some useful electrical device. On a float in the rear, illuminated with electric lights, and garbed in their initiation costumes, rode the degree team, which was composed of the following: W. R. Phipps, Jupiter; W. J. Weber, Mercury; Ed. F. Hall, Pluto; K. E. Mason, Apollo; Mr. Caldwell, Neptune; C. J. Matthews, Mars; E. Jones, Hercules; A. L. Harris, Vulcan; Harry Tipple, Clarence Gernand, Ralph Zerwekh, A. E. Kirk, Fritz Bland and Howard Bates, imps. A line of automobiles brought up the rear.

Following the parade the initiation took place at the Crystal-Majestic Theater, where about 40 candidates from Galveston, Houston and Dallas were made members of the Order.

The celebration was closed by a banquet at Harmony Club Hall, at which Fred M. Lege, Jr., acted as toastmaster, and the following responded with speeches: Max Sterett, H. B. Sewell, W. J. Drury, J. C. Everett, B. Clark, Sergeant Scholosky of the Nineteenth Infantry Band, C. G. Matthews, A. K. Young, K. E. Mason, Max Levy, W. R. Phipps, Fred A. Walters and Mr. Bering. A humorous poem was read by Ed Hall, member of the Houston League.

Meeting of International Illumination Commission.

The fourth meeting of the International Photometric Commission was held in Berlin, Germany, on August 27 and 28. This commission was formed in 1900 by the International Congress of the Gas Industry. In 1911 it decided to ask the electrotechnical committees of the nine countries represented in the organization to send delegates. The gathering this year was the result of this policy and it adopted a new constitution and changed the name to International Illumination Commission. Ten countries were represented at this meeting: the American delegates being Louis Bell, Edward P. Hyde, Arthur E. Kennelly, C. O. Mailloux, Preston S. Millar and Clayton H. Sharp.

The following officers were elected: President, M. Vautier, of France; vice-presidents, Prof. H. Bunte, of Germany; Dr. E. P. Hyde, United States; Dr. Ludwig Kusminsky, Austria; honorary secretary, Mr. C. C. Paterson, England; treasurer, Mr. Weiss, Switzerland. Paris was selected as the next meeting place.

The president has been authorized to reappoint the existing committees of the old commission with additions.

California Power Company Gets Federal Permit.

On September 5 the Secretary of Agriculture signed a water-power permit granting to the Sierra Electric Power Company the right to use for power development certain land within the Lassen National Forest, California. The company is organized under the laws of the state of California and has its office and place of business in Oakland.

The water-power project is located on Mill Creek and approximately 25 miles east of the city of Red Bluff in Tehama County. By means of low dams across the creek the flow is to be diverted into a conduit with a capacity of 300 second-feet and a total length of more than 16 miles. At the upper end of the pressure pipes a small regulating reservoir is to be built. By this means, it is hoped to reduce, if not eliminate, a large portion of the water waste occasioned by hourly fluctuations of the load. In the power house, which is to be built of concrete, there will be installed machinery with a capacity of 22,500 kilowatts. The power will be transmitted at 110,000 volts.

Oakland Road Opens.

The formal opening of the Oakland, Antioch and Eastern Railway was celebrated on September 3 with an elaborate program. On that day the schedule of eight trains daily between Sacramento and San Francisco became effective.

On August 30, a two-car train "The Stockholders Special," was run through from San Francisco to Sacramento, a distance of 91 miles. The trip was made in three hours and ten minutes, the running time being less than that on any of the steam lines between these points. The J. G. White Companies were well represented on this trip by members of the San Francisco office.

The Shepard Pass tunnel, built for this road, and located about five miles from Oakland, is nearly two-thirds of a mile long, the longest thus far constructed in this country for an interurban electric railway. The new road is equipped with electric locomotives and steel cars, including Pullman and observation cars.

The distribution system from the railway substations is 1,200-volt direct-current with overhead catenary construction.

Association of Edison Illuminating Companies Convention.

At the thirty-fourth convention of the Association of Edison Illuminating Companies, held at Cooperstown, N. Y., September 8 to 12, officers were elected for the ensuing year as follows:

President, Arthur Williams, New York.

Vice-president, William Chandler, Sault Ste. Marie, Ont.

Secretary, George C. Holberton, San Francisco.

Treasurer, Louis A. Ferguson, Chicago.

Assistant secretary, Walter Neumuller, New York.

At the opening session of the convention, held Tuesday morning, President Williams reviewed the development of incandescent lighting and its connection with the history of the Association. He also discussed the matter of public relations and the responsibility which rested upon the management of public utility corporations.

The Meter Committee submitted its report through S. G. Rhodes, of the New York Edison Company, chairman of the committee. The results of an extensive laboratory investigation of three types of direct-current meters were given. It was recommended that these meters, which are of the mercury type, and can be built materially cheaper and maintained at less expense than the present type of watt-hour meter, be given a careful investigation by member companies.

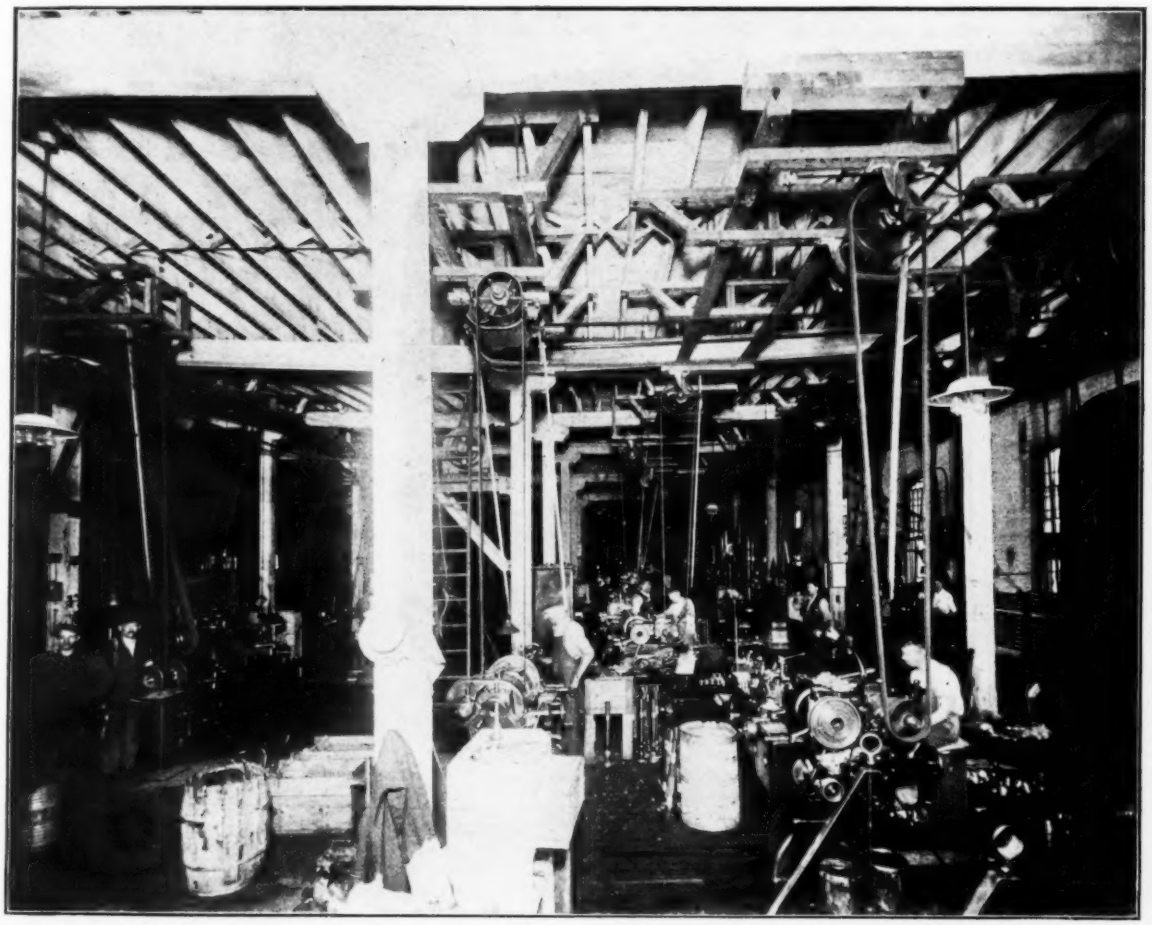
E. W. Lloyd, of the Commonwealth Edison Company, Chicago, chairman of the Committee on Heating, presented a report for that committee. This report was devoted to an account of what has been done by member companies in promoting the use of electric heating appliances.

The report of the Lamp Committee was presented by John W. Lieb, Jr., vice-president of the New York Edison Company. This report reviewed the changes which have been made through the introduction of the drawn-wire filaments and the improvements which have come about in manufacturing processes. These improved methods have raised the performance of tungsten lamps from the consumption of 1.13 watts per candle in 1911, and a useful life of about 685 hours, to an efficiency of one watt per candle, with a useful life of nearly 2,500 hours. While no extensive tests have been made during the year on foreign lamps, the data which are available make it apparent that the American-produced lamp is equal to or better than the best European product. The rating of the American lamp is also closer to the standard than the lamps of foreign production. A great deal of interest was shown in the exhibit of the "half-watt" tungsten lamp, concerning which much has been published recently. These lamps ranged from 500 candlepower to 5,000 candlepower.

Electricity in Automobile Manufacturing—I.

As it is impossible to accurately gauge the demands of an automobile factory for more than a year in advance, maximum flexibility with minimum investment must be considered. Central-station power is the only solution to this problem. Data on operating features and horsepower requirements are given in this article.

The operations involved in manufacturing automobiles may roughly be divided into two classes: machine-shop work and woodworking. In many plants bodies, trimmings and accessories are purchased from outside firms and machine-shop work, assembling and finishing constitute the entire range of work done. However, in this respect, no two automobile factories are alike, so that in discussing the subject of electricity in this industry no attempt will be made to classify the various operations in automobile building, or to distinguish between car manufacturers and accessory manufacturers.



Motor-Driven Machines in Machine Shop of Walker Vehicle Company.

There is one feature in connection with this industry which predominates, namely, the conditions under which automobile factories operate are peculiar to the industry itself rather than to machine-shop practice, as might be supposed. The phenomenal growth of business has been the prime factor in producing this condition. One year a large number of cars may be sold; the next year sales may be away behind. It is impossible, therefore, accurately to gauge the demands for more than a year in advance. Maximum flexibility with minimum investment must, therefore, be considered; the factory must be equipped to supply the greatest demand upon it in any one year, and at the some time arranged to operate economically in off years.

The solution of the problem lies in motor drive and central-station power. The flexibility of central-station service is too well known to need special comment. In dull periods, only the machines actually needed may be operated and power costs will be proportional to the useful work delivered to each machine. Extensions may be made, in busy periods, with a minimum expenditure of time and money.

In determining on the motor outfit for driving machines in an automobile factory, one of the most difficult questions to decide is that of group or individual driving, except in the very large plant where great numbers of similar machines would make the cost of individual drive prohibitive, even if it was desirable from an operating standpoint. The most general solution of this problem is a combination of the two drives.

The following data contain the sizes and speeds of motors usually employed in automobile plants with the average duty indicated for machine tools.

Boring Machines.—Where boring machines are specialized, performing only one operation, there is no good reason

why the motor drive should be preferred to belt drives. Where, however, the machine is used for a multiplicity of operations, such as drilling, boring, reaming and facing, a motor drive is beneficial if a variable-speed motor is used. The range of speed of the motor should be as wide as possible, that no gears may have to be shifted for the entire set of operations on a single hole. Especially where a boring machine is used for facing, this variable speed will be found highly economical.

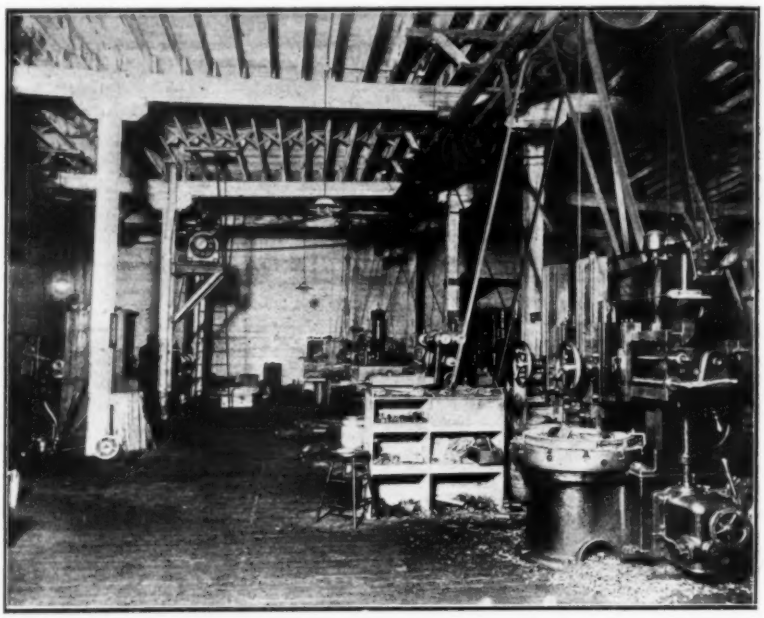
For extension boring mills, five-horsepower motors are used to move the housings on from 10-foot to 16-foot mills, 7.5 horsepower for from 14-foot to 20-foot mills and 10 horsepower for from 16-foot to 24-foot mills. The load-factor of the driving motor on boring mills averages from 10 to 25 per cent.

Drills require a shunt-wound, adjustable-speed motor with good regulation. Gear, chain or belt drive may be used; belt preferred to avoid breakage of drills. The load-factor of motor-driven drills is about 40 per cent, when the larger drills applicable thereto are used. If the smaller drills are used the load-factor averages 25 per cent and lower.

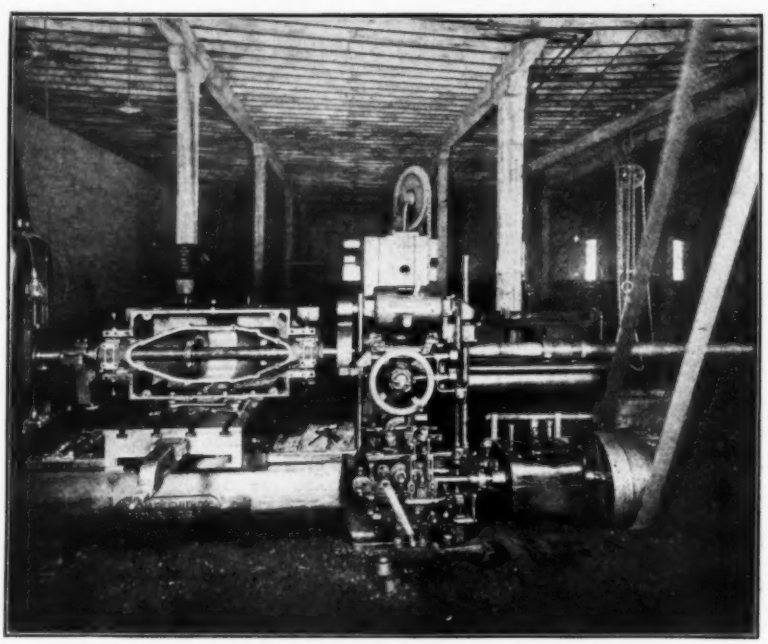
Drill Presses and Radial Drills.—Generally speaking, the upright drill is used for manufacturing operations and does not require frequent changes of speed. There are, however, many exceptions, for instance, where upright drills are used to do all the operations on a piece by means of a jig. In this case frequent changes of tools, and therefore of speeds, are required, and an individual motor drive, whether direct-connected to the machine, or operating on the countershaft, is of the greatest benefit. No great benefit can be derived from a constant-speed motor with this type of machine. Radial drills may be considered the same as upright drills. There is an additional reason why radial drills should be motor-driven—they are often used in the neighborhood of the assembling floor.

Drill Presses, Sensitive.—The only reason why a sensitive drill should be individually motor-driven is that it is often used in an assembling department, where height of ceiling and crane service would make a belt drive awkward or impossible. Most sensitive drills have in themselves all the speeds required for their work, so that any type of motor will be adaptable. The motor may either be directly applied to the machine or may drive a countershaft on a stand, or be placed on the floor by the side of the machine in case the machine carries its own set of cones or other variable-speed device.

Grinders.—Grinders in general require so many various movements driven from countershafts that it is hardly possible to apply a single motor directly to the machine. The best that can be done is to attach the countershaft to the machine and drive the former from a motor standing on the floor or on a bracket attached to the machine. In isolated cases it would be well to have one or more motors, each controlling a single operation, attached directly to the machine.



25-Horsepower Motor Driving Milling Machine.



Special Motor-Casing Machine, Walker Vehicle Company.

Lathes.—The average load-factor for motors driving lathes is from 10 to 25 per cent. On some special machines, as driving-wheel and car-wheel lathes, the cuts are all heavy, which increases the average load-factor to from 30 to 40 per cent. Lathes require shunt-wound, adjustable-speed motors with good regulation. Gear, chain or belt drive may be used. The pressure on the cutting tool may be divided into two components, one for shearing metal and one for bending the chip.

Experiments have shown that for cuts of ordinary dimensions and shapes on the same material, the pressure on the cutting tool is nearly proportional to the area of the chip and is practically independent of the cutting speed. The pressure varies with the nature and hardness of the material and with the angle and sharpness of the cutting tool.

For high spindle speeds at small diameters of work on medium-size lathes, the power required to drive the tool idle is an appreciable amount, but under these circumstances, the size of cut and amount of power required is considerably smaller than with the maximum cut at ordinary cutting speeds and on ordinary diameters of work.

On very large lathes the power required to drive the tool idle is a small per cent of the maximum amount of power which can be absorbed by the cutting tools, and except in special cases, this can be neglected.

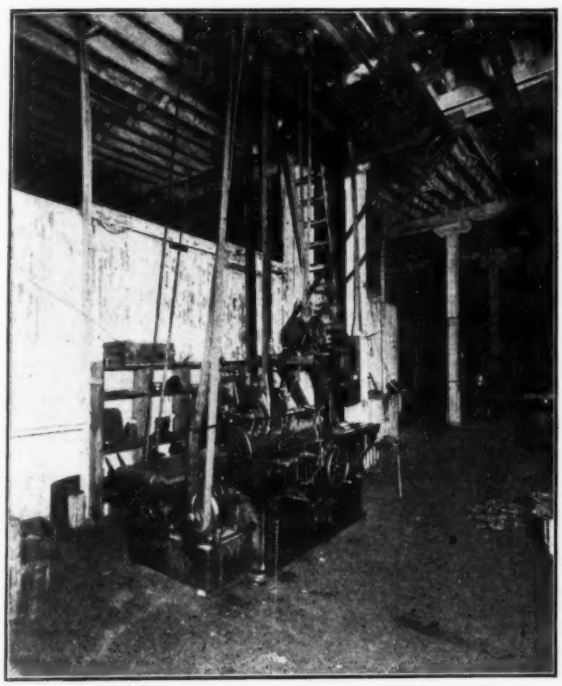
The amount of power can, therefore, be reduced to a simple formula, horsepower = constant × cubic inches of metal removed per minute. The value of this constant depends upon the nature of pinions attached to the motor shaft, and this should be kept as low as 1,000 feet per minute for steel pinions meshing into steel gears; the size, weight and cost of motor for a given output is dependent on the minimum speed.

Bench Lathes.—To be driven from a countershaft, attached to the wall or bench and driven in its turn by a motor. Any kind of motor, except a series-wound or heavily compounded motor, will do. The object of the motor drive is to get the machine in the best possible location without regard to the location of the line shafting. A number of these machines may be driven by a common line shaft, driven by a motor.

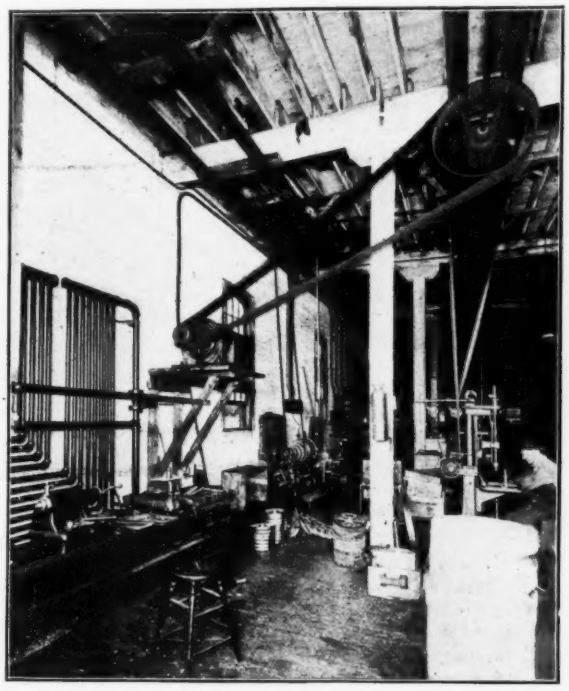
Chucking Lathes.—Generally speaking, there is little reason why a chucking lathe should be motor-driven. Most chucking lathes are provided with the necessary mechanism to shift speeds quickly. A few types handling large work may be motor-driven to advantage, though practically the only advantage lies in the fact that small gradations in speed can be thus obtained. Such machines therefore require a variable-speed motor.

Speed Lathes.—To be driven from a countershaft, located under the lathe, or by a direct-connected motor. In the latter case, a variable-speed motor is to be preferred, if direct current is available. Motor drive is recommended when the machine is used in the assembling department, as the machine may then be placed where it is most needed, and the assembling department being generally of greater height than other departments, crane service would interfere with countershaft. There will be no material gain, if the machine is to be used for ordinary shop operations.

Engine Lathes.—Various modes of motor driving are in use. Some makers furnish motor-driven engine lathes as standard apparatus. Some have a headstock with a limited number of speeds and depend on a variable-speed motor to fill out the speeds of the lathe. Others apply a constant-speed motor, or one with a limited amount of variation, to an all-geared headstock. In general the use of this class of machines in the shop would naturally lead to group drive. Advantages of the individual motor drive lie



10-Horsepower Motor Driving Landis Grinder.



25-Horsepower Motor Driving Portion of Machine Shop.

and hardness of the material, dimensions of the cut, and angle and sharpness of the cutting tool.

Average values of this constant for various materials are as follows:

Cast iron	0.33
Low-carbon steel	0.5
High-carbon steel	0.7
Brass	0.33

Experiments to determine the most satisfactory speeds for heavy cuts in various materials have shown the following results:

Cast iron	40 to 60 feet per minute
Cast steel	40 to 60 feet per minute
Low-carbon steel	80 to 120 feet per minute
High-carbon steel	50 to 80 feet per minute
Brass	150 to 200 feet per minute

In determining the proper speed variation for motors driving lathes there are two points to consider: the maximum speed is limited by the peripheral speed

Approximate Horsepower for Engine Lathes.

Horsepower of Motor		2	3	5	7.5	10	15	20
Speed of Motor		650 to 1300	550 to 1100	550 to 1100	525 to 1050	500 to 1000	450 to 900	400 to 800
Size of Engine Lathes	for light duty	18-20"	22-24"	27-30"	36-48"	.....	.....	.....
	medium duty	14-16"	18 20"	22-24"	27-30"	36-42"	48-54"	
	heavy duty and turret lathes	.....	14-16"	18-20"	22-24"	27-30"	36-42"	48-54"

in the possibility of completing a job in one setting.

Heavy Engine Lathes, Forge Lathes, Etc.—To be driven by a direct-connected motor. The motor should be direct current, as these machines are too heavy to permit a convenient all-gear drive. If no direct current is available and there is only one machine of its class in the shop, and this is used for an occasional job only, an alternating-current motor could be used, leaving a wide gap in the speeds. If these machines are used for manufacturing purposes, however, it will pay to install a small synchronous connector. The speed range in the motor does not need to exceed two to one, though a wider range is better if obtainable without complications or large expenses. The position of the motor should be low, as the vibrations in the motor support have a decided influence on the capacity of the machine, as well as on the repair bill. The output of this class of machine may easily be increased from 20 per cent to 25 per cent by motor drive.

Further advantages of the motor drive are, the possibility of placing the machine in the line of the routing of heavy work, and of placing it immediately under the traveling crane. This latter object may be reached with a belt-driven machine by placing the headstock under the gallery, if the construction of the shop lends itself to this arrangement, but the same convenience as that of the motor drive cannot be obtained.

Milling Machines.—The problem of a successful arrangement for motor driving on a milling machine has been found quite complex because of the peculiar service to which milling machines are put. The principal points to be considered in the design of such an arrangement are:

(a) The wide range and great number of speeds that are now a necessity for economical milling. (b) The large amount of power consumed, which requires a motor that is very large as compared to the size of the machine. (c) The fact of the large number of times a milling machine must be started and stopped in a day.

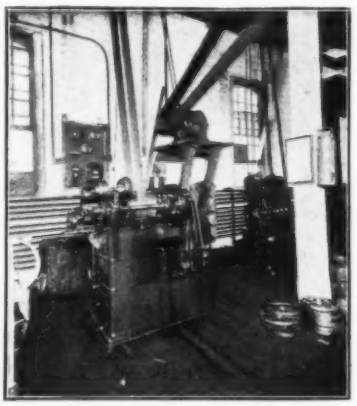
The only satisfactory arrangement of a direct-connected electric drive for milling machines is obtained by the use of an adjustable-speed motor which should be a shunt-wound direct-current machine. The variation in speed being obtained from the motor obviates the use of the usual mass of gearing.

The larger sizes of knee-and-column type machines, if motor-driven, will give the best results if the motor is of the variable-speed type, especially where these machines are used for gang work. This is due to the fact that the speed of the mills is dependent on the largest cutter in the gang, while the feed is dependent on the smallest cutter, not counting the limitations due to the nature of the work. It is therefore important that the speed should be as close to the permissible limit as possible. When applied to this type of milling machine the motor should be as low down as possible, as vibrations in the machine have a marked effect on the quality of the finish.

The motor is mounted on an extension which is cast to and forms part of the base of the machine. This brings it near the floor, thereby adding to the stability of the machine and, as the entire motor arrangement is at the rear, it occupies space which would not be available for other purposes because it must be kept free to accommodate the table travel.

The motor used is shunt-wound and capable of a speed adjustment of 2.5 to 1. This range is multiplied by the double-back gears, giving at the spindle a wide range of speeds.

For the average milling operations the load-factor averages from 10 to 25 per cent. On slab milling machines, where



Motor Driving Gear Shaper.

large quantities of metal are removed, it will average from 30 to 40 per cent. The work on this class of machinery is usually light and much time is required in making adjustments. Hence the load-factor is rarely found to be higher than 20 per cent.

Planers.—On planers the load-factor averages between 15 and 20 per cent. The motor must be large enough to reverse the bed quickly, yet this peak load occurs for such short intervals that it does not increase the average load per cycle very much. The power required to operate a planer for removing a given amount of metal by means of the cutting tool differs considerably from that required by a lathe. On account of the reciprocating motion, the speed of the planer is limited by the ability of the driving belt to stop, reverse and accelerate the platen.

The maximum cutting speed is usually below 40 feet per minute and a variation in cutting speed of 1:3 or from 13.3 to 40 feet per minute is all that will be required in most cases. For very hard or tough steel a cutting speed of 8 or 10 feet per minute is sometimes required and in special cases of light cuts on soft steel a cutting speed of 50 to 60 feet per minute has been used successfully.

The speed of the return stroke should be kept up to a maximum, which, on ordinary planers, is limited to 80 feet per minute. The function of the motor drive for a planer consists in being able to change the speed of the cutting stroke by small increments through a range of 1:3 and to have a high speed on the return stroke at all times.

The torque of the motor for one cycle is a variable quantity, and the maximum torque is usually required at the end of the cutting stroke for the reversal and acceleration of the platen to the high speed of the return stroke.

In order to reduce the increase in current on motor at the moment of reverse of platen, it is desirable to have a heavy rim on countershaft pulley which carries the belt for operating the planer on the return stroke. The motor should also be compound-wound so that it will slow down slightly at the moment of reverse of plate, and thus permit the flywheel pulley to give up some of its stored energy and thus reduce load on motor.

In order to obtain a variation in speed on cutting stroke with a constant speed on return stroke, a most satisfactory solution of the problem consists in the use of two countershafts mounted on the planer housings. On one countershaft, which may be called "A," is mounted the flywheel pulley which carries belt for driving planer on return stroke. This countershaft is driven by a motor also mounted on the housing by means of gearing, chain or direct connection. The speed of this countershaft is always proportional to speed of motor. On the other countershaft, "B," is mounted a pulley which carries belt for driving planer on the cutting stroke. Countershaft "B" is driven from countershaft "A" by means of two or more runs of gearing, which will give two or more adjustments in the speed ratio between "B" and "A," and thus permit of adjustment in speed of cutting stroke with constant speed of return stroke. In order to obtain more finely divided gradations in speed of cutting stroke, the motor speed can be adjusted by means of field weakening, but the amount of speed increase for a compound motor should not be greater than 1:1.33.

A more common method of obtaining adjustment in speed of cutting stroke consists in operating the motor through a wide speed range, and using only one countershaft. This method has two objections: first, there is a corresponding variation in speed of return stroke, and, secondly, a larger motor is required if adjustment in speed is obtained by field weakening.

Automobile Manufacturing Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Automobile plant manufacturing chassis only. There is a total of 125 men employed, some of whom work nine hours during the day and the remainder at night.

Total connected horsepower, 98. Total number of motors installed, 8. Average kilowatt-hours per month, 10,012.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-Hours	Month	Kilowatt-Hours	Month	Kilowatt-Hours
January	9,570	May	8,820	September	8,100
February	11,000	June	7,280	October	10,510
March	8,580	July	7,880	November	10,980
April	16,640	August	9,280	December	11,510

Load-factor, 19 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power	Speed R. P. M.	Application.
1	7.5	1,700	Belted to a six-foot shaft (two hangers) and two countershafts (four hangers) driving one Beach Manufacturing Company jig saw; one Bentel & Margedant 24-inch pattern lathe.
1	15	1,120	Belted to 120 feet of shafting (22 hangers) and 12 two-hanger countershafts driving one Bradford 14-inch engine lathe; one Jones & Lamson three-inch turret lathe; one Columbia 30-inch boring mill; one Lodge & Shipley 18-inch lathe; one Binsse horizontal boring mill; one Lodge & Shipley 20-inch combination turret and engine lathe; one Laponite No. 2 broaching machine; one Jones & Lamson 2.25-inch turret lathe; one Prentice Tool & Supply Company 16-inch lathe; one Dresses 18-inch turret lathe; one six-inch forming lathe; one Jones & Lamson 2.25-inch chucking lathe; one Baker Brothers 24-inch double-machine drill; one polishing lathe (two 12-inch by three-inch wheels); one 24-inch exhaust fan; one tire bender; three eight-feet by 12-inch tumbling barrels; one automatic punch press (32-inch flywheel, six-inch by 2.5 inch rim); one Woodward & Rogers tapping machine; one G. W. Heartley punch press (19-inch flywheel, four-inch by two-inch rim); one C. S. Shuster wire straightener (18-inch flywheel, 4.25-inch by 2-inch rim); one double emery wheel (9-inch by .5-inch wheels); one No. 1-C punch press (12-inch flywheel, 2-inch by 2-inch rim); two two-spindle special horizontal drills; one spoke leader (30-inch flywheel, 4.25 by 2-inch rim); one thread rolling machine; one Fox rim-drilling machine; one Rockford 18-inch drill; one five-ton screw press; one Fairbank 12-inch sensitive drill; one spoke-shearing machine (16-inch flywheel, 4-inch by 1.5-inch rim).
1	5	1,700	Belted to a 14-inch shaft (four hangers) and three two-hanger countershafts driving one 16-inch cut-off saw; one Witherby, Rugg & Richardson 12-inch jointer; one Hermance 12-inch combination rip saw and horizontal drill; and one 20-inch pony planer.
1	7.5	1,700	Belted to a 30-foot shaft and a two-hanger countershaft driving one J. F. Coffman miller; one eight-inch sensitive drill; one E. W. Bliss No. 2.5 punch press, (24-inch flywheel, five-inch by three-inch rim); one Standard Machinery Company No. 2-C punch press (18-inch flywheel, 3.5 by 2.5-inch rim); one 18-inch drill press; one Mossberg No. 2-C punch press (18-inch flywheel, 3.5-inch by 2.5-inch rim); one Rockford 18-inch drill.
1	15	1,120	Belted to a nine-kilowatt 12-volt 750-revolutions-per-minute generator.
1	40	850	Belted to 180 feet of line shafting and five two-hanger countershafts driving special tire rolling department (secret process); one West tire setter; one 150-light 110-volt direct-current generator; one tire expander; one 2,000-pound freight elevator; four Rockford 18-inch drills; two Cincinnati two-inch plain millers; two 12-inch sensitive drills; one Bradford 16-inch lathe; one Michigan Machinery Company size 21 punch press (24-inch flywheel, four-inch by two-inch rim).
1	0.5		Belted to a 16-inch exhaust fan.
1	7.5	1,700	Belted to line shafting driving one Porter 24-inch lathe; one Bradford 22-inch lathe; one Steptoe 16-inch shaper; one 10-inch tool grinder; one V and O No. 3 punch press; two special tire rolling machines; one E. W. Bliss No. 2½ press.

There are three Thomson welding machines installed taking power from the central-station circuit.

A planer may be termed a constant-torque machine so that the horsepower required to operate it increases with the speed. In order to develop the required horsepower at the maximum speed on a field-weakened motor, it is necessary that the motor be large enough to develop the maximum horsepower at the minimum speed. As a compound motor cannot be used for an amount of speed increase greater than 1:1.33, it is necessary to use a shunt motor with greater intermittent overloads at weakest field, which causes excessive sparking.

Screw Machines.—Small machines of

Automobile Manufacturing Data—Sheet No. 2.

Electric-vehicle factory manufacturing a line of commercial electric vehicles. The complete chassis is manufactured in this plant; bodies must be supplied by the purchaser. The electric motors used are also purchased but these are installed on a special motor frame made at the factory.

Total connected horsepower, 165. Total number of motors installed, 11. Average kilowatt-hours per month, 13,322.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-Hours	Month	Kilowatt-Hours	Month	Kilowatt-Hours
January	9,240	May	13,830	September	14,350
February	12,350	June	15,390	October	12,250
March	12,780	July	17,870	November	11,860
April	13,090	August	14,470	December	12,390

Load-factor, 15 per cent; operating-time load-factor, 31 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power	Speed R. P. M.	Application.
1	10	1,250	Belted to a line shaft driving one Norton tool grinder; one Porter & Johnston shaker; one Brown & Sharp milling machine; one Norton 14-inch lathe; two sensitive drill presses; one drill grinder; one Bliss No. 19 punch press and one blower for tempering furnaces.
1	25	1,250	Belted to line shafting driving one rivet grinder; one small speed lathe; one Norton 14-inch lathe; two American 18-inch lathes; one Baker drill press; one American shaker; one eight-spindle drill press; one sensitive drill press; one Brown & Sharp milling machine; three Barnes drill presses and one Warner & Swasey screw machine.
1	25	1,250	Belted to line shafting driving two Fellows gear shakers; three Jones & Lamson turret lathes; two 24-inch Hodge & Shipley lathes; and two double emery wheels.
1	25	1,250	Belted to line shafting driving one Beeman & Smith horizontal blowing mill; one Hudson horizontal boring mill; one Cincinnati No. 14 vertical milling machine; one five-foot American radial drill; one Milwaukee milling machine; two Colburn 42-inch vertical boring mills; one cut-off saw; one bolt-threading machine; and two disk grinders.
1	10	1,800	Belted direct to a Landis grinder.
1	10	1,250	Belted to shafting one punch press; two drill presses; and one pressure blower for gas furnaces.
1	25	1,250	Belted direct to a 6-by-6 air compresser supplying air to riveting machines.
1	10	1,800	Belted to line shaft driving emery grinders and punch presses in blacksmith shop.
1	5	1,250	Direct-connected to forge blower.
2	10	1,200	Each driving elevator.

this class are generally group-driven. Large machines may be motor-driven to good advantage. The larger sizes have generally one or two speeds for one piece of work, though these speeds may be varied when the machine is reset for a new piece of work. The speed given to the machine must naturally be proportional to the largest diameter to be turned, or, in other words, to the size of stock used. This will reduce the speed for some of the operations, such as drilling and reaming, far below the economical speed. The amount of time saved by the application of the variable-speed motor may be considerable. Where the construction of the machine permits, two motors, one for feed and one for speed, would give still better results. In all cases variable-speed motors should be used.

Shapers, Slotters, Etc.—What is true of planers is also true of these classes of machines. Local conditions may make it advisable to drive them individually by motor, but generally speaking, there is no great benefit with this drive. The work done on shapers is of a varying character. With light work the load-factor will not exceed from 15 to 20 per cent; with heavy work, the load-factor will be as high as 40 per cent. The conditions encountered on slotters are similar to those on shapers.

(To be continued.)

Coon Rapids Project.

Construction on the Coon Rapids hydroelectric development on the Mississippi River near Minneapolis is being pushed rapidly by the engineers and constructors, H. M. Byllesby & Company. A force of 700 men is now engaged on the dam, which it is planned to complete by December. There will be an initial installed capacity of 10,000 horsepower in five units and an eventual capacity of 14,000 horsepower (instead of 12,000 horsepower, as first reported). This will supplement the resources of the Minneapolis General Electric Company, whose business has increased rapidly during the past year.

The dam is of solid concrete, reinforced, and has been built so far under exceptionally favorable circumstances, the anticipated June rise in the Mississippi River not materializing. The construction camp, with its hospital, water supply, electric lighting and moving-picture show, has been declared a model by visiting engineers. The last improvement is the inauguration of a public school.

The bonds of the Northern Mississippi River Power Company, the company owning the development, were purchased some time ago by Bachman & Company, of Philadelphia.

Motor Drive in Tanneries.

The increasing use of electricity in tanneries is a noteworthy development, and the fact that tanners are now cutting up much of the leather which they make, instead of selling whole or half hides, is a factor in favor of the change. Cutting machinery is nearly all being motor-driven, although the tannery often has a steam plant for carrying on many manufacturing and drying operations. Two Louisville plants, those of the American Oak Leather Company and William Schuff & Company, are equipping cutting departments in which the machines will be individually motor-driven.

Commercial Practice
Management, Rates, New Business

Neighborhood Merchandising.

All large cities are usually made up of a number of neighborhoods, each with its own social and business life. At the present time there is in progress at Brownsville, the clothing manufacturing center of Brooklyn, N. Y., populated almost exclusively by Hebrews, an industrial exhibition. Here, under a large tent, occupying an entire block, are assembled a number of booths illustrating the industrial progress of Brownsville, and right alongside the display of the various classes of garment makers may be seen the brilliant exhibit of the Edison Electric Illuminating Company of Brooklyn, which utilizes such affairs to get in personal touch with present and prospective customers, and makes a point of entering into the spirit of such occasions, just as the local merchant does.

An attempt is made to show the public the right way to use various kinds of lamps, appliances and motors; for instance, a tailor's iron is rigged up complete with regulator stand, pilot switch and cord supporter; household appliances are demonstrated, and various signs attached to an exhibit of tungsten lamps to show how much current is consumed by each lamp and what it costs to operate.

Results show that considerable interest has been aroused among prospective customers by the Edison exhibit. The first night six prospects requested estimates for the wiring of their homes; four sweat-shop owners applied for further demonstration of tailor's irons; several leads were received for 500-watt tungsten lamps, one being for 25, to be used in a large dance hall. There were also many inquiries handled for changes from carbon to tungsten lamps.

Exhibit of Brooklyn Edison Company.

This method of exhibiting at local affairs, bazaars, and other social gatherings seems to be a cheap and practical way of awakening public interest.

The tent in which the Brownsville exhibit is held is lighted with forty 500-watt tungsten lamps, which, in itself, is a big advertisement for electric light. Next to the Edison exhibit, shown in the accompanying illustration, is the booth of an electrical contractor, and farther on, the display of a garment makers' union, which demonstrates that the best way to run sewing machines is with electric motors.

Decatur Railway & Light Supplies Power for Wabash Shops.

The Decatur Railway & Light Company has put in service the newly completed 13,000-volt transmission line and sub-stations which will supply electrical energy for the new $2,000,000 railroad shops being built at Decatur by the Wabash Railroad Company. The connected load at the shops is 2,600 kilowatts, with a maximum demand on the central-station power house of about 1,600 kilowatts. The Decatur Railway & Light Company constructed a three-phase, 13,000-volt line from the power house of the cite of the new shops, a distance of about three miles. A total of about 3,000 kilowatts in transformer capacity was installed. The line was placed in service during the past week.

Electric Vehicle Meeting.

The regular monthly meeting of the Electric Vehicle Association of Amerca will be held in the Edison Auditorium, 44 West Twenty-seventh Street, New York City, on Tuesday, September 23, at 8 p. m. "The Value of Power Wagon Operation to the Community" is the title of the paper to be presented by F. J. Ryan of *The Commercial Vehicle*.

It is hoped that all members will make an effort to attend. The change in address of the meeting place should be noted.

Decorating Lampposts.

Henry E. Tuley, president of the Louisville Commercial Club, has taken up in earnest the plan of having the ornamental lighting standards used in that city decorated with hanging flower-baskets, a practice observed while abroad recently. The merchants, sign companies and central station operating the ornamental lighting systems will be asked to co-operate in putting the plan into effect. One of the hanging baskets has been located at Fifth and Jefferson Streets for demonstration purposes.

Increase in Alabama Coal.

The production of coal in Alabama in 1912 was 16,100,600 short tons, valued at $20,829,252, an increase of 1,079,179 tons in quantity and $1,749,303 in value over the production of 1911.

Addenda.

In the issue of August 16 a number of curves are given on pages 315 to 317 for use in a solicitor's pocketbook. The conditions to which these curves apply are not given in every case. Thus, in Fig. 1, the transformer costs are net, f. o. b. factory; the cost of pumps in Fig. 3 applies for a head of 250 feet; Fig. 4 does not show cost but power requirements; Fig. 5 applies to tungsten incandescent lamps, with Alba or Lucida glassware. In the table for retail power rate on page 317, the words "per horsepower" should appear only in the first line; and the rate of 2 cents should apply to "Next 2,000 kilowatt-hours per month," instead of 1,000 kilowatt-hours.

Two Big Units Ordered for Philadelphia Company.

The Philadelphia Electric Company has recently placed an order for two turbo-alternators having capacities of 30,000 and 35,000 kilowatts respectively. It will be necessary to build an addition to the Christian Street power house.

Time-Keeping and Meter Records.

The accompanying illustrations show the forms used by the Charlotte Electric Railway Company, Charlotte, N. C., in making daily reports of the men's time and of meter readings. The form shown in Fig. 1, which is a time sheet, is especially valuable where it is the custom for employees to work in different departments of the company, such as the power house or operating department, maintenance-of-way department, repair shop, car house, etc.

Charlotte Electric Railway Company
DAILY TIME SHEET
Charlotte, N. C., March 29, 1913

NAMES	Labor and Other Expense Producing Power	Repairs and Track Labor	Paving	Cleaning, Sanding and Greasing Track	Labor, Repairing Street and Road Crossings	Labor, Repairs to Poles and Fixtures	Labor, Overhead Distribution System	Repairs to Buildings and Structures	Repairs to Power Plant and Equipment	Repairs to Cars, Body and Trucks	Repairs to Cars, Motor and Electric Parts	Labor, Repairs to Shop Machinery and Tools	Power Plant Employees	Car House Employees	Labor, Park Employees	RATE	AMOUNT $	Cts.
D. F. Furr													10					
C. C. Waisner													10					
L. N. Johnson													10					
Sam Neeley													10					
F. N. Jones							10											
S. M. Walker														10				
Milas Alexander														10				
W. W. Hamilton										10								
L. S. Fisher							10											

Fig. 1.—Daily Time Sheet.

Fig. 2 is a form for the daily report of meter readings upon the station switchboard and this form can also be used for monthly reports.

Fig. 3 represents another form of report for meter readings. It is intended here that the switchboard attendant shall mark the dials on this form at the time of making the reading, as well as putting down the amount in figures, in order to avoid as far as possible any opportunity for errors or mistakes in transferring the reading of the meter.

J. B. Linker.

Charlotte Electric Railway Company
DAILY REPORT
POWER HOUSE
Charlotte, N. C. March 29, 1913

		Time in Operation	Hours Run	Statement of Meter	Difference Kilowatt Hours
Engine 1	6 A.M.-6 P.M.	on 6 a.m.		47231 00	
	6 P.M.-6 A.M.	off 12:30	18:30	47168 00	70 00
		p.m.		47298 00	
				47235 00	63 00
Engine 2	6 A.M.-6 P.M.	on 6 a.m.		48326 00	
				48290 00	36 00
	6 P.M.-6 A.M.	off 12:30	18:30	48330 00	
		p.m.		48322 00	80 00
		Total Engine Hours	37	Total Kilowatt Hours	249 00
Rotary 1	6 A.M.-6 P.M.	on 6 a.m.		63642 00	
				63576 00	66 00
	6 P.M.-6 A.M.	off 6 a.m.	24	63695 00	
				63642 00	53 00
Rotary 2	6 A.M.-6 P.M.	on 6 a.m.		7666 00	
				7596 00	70 00
	6 P.M.-6 A.M.	off 6 a.m.	24	7702 00	
				7666 00	36 00
Rotary 3	6 A.M.-6 P.M.			94132 0	
				0	0
	6 P.M.-6 A.M.			0	0
		Total Hours	48	Total Kilowatt Hours	225 00

Southern Power Co. Purchasing Meter	00		00	Charlotte Power Co. Selling Meter	00		00
	19270 00		00		00003 00		00
	00		00		00		00
	00		00		00		00
	Total Kilowatt Hours		00		Total Kilowatt Hours		00
Southern Power Co. Selling Meter	00		00	Charlotte Power Co. Purchasing Meter	00		00
	00031 00		00		00078 00		00
	00		00		00		00
	00		00		00		00
	Total Kilowatt Hours		00		Total Kilowatt Hours		00
Station Lights	4310		3339		Motor Excess	3896	
	4273	37	3328	11		3721	175

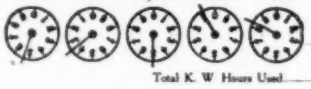
Circuit-breaker No. 3 out 5 minutes.

Fig. 2.—Report Form for Meter Readings.

PIEDMONT AND NORTHERN LINES
DAILY REPORT

Dilworth Sub-Station
6 A. M. March 28, 1913 to 6 A. M. March 29, 1913

TOTAL METER

6 A. M.		5352100
Previous Date 6 A. M.		5350800
Total K. W. Hours Used		1300

HIGH RATE METER

6 A. M.		2534600
Previous Date 6 A. M.		2534000
High Rate K. W. Hours Used		600
Low Rate K. W. Hours Used		500

CIRCUIT BREAKER OUT

Feeder No. 1
Feeder No. 2
Feeder No. 3

REMARKS

Station Attendant.

Fig. 3.—Another Form for Meter Readings.

Electrical Construction

THE WIRING IN A MODERN STORAGE-BATTERY PLANT.

By H. G. Wilson.

With the rapid increase in the popularity of electrically propelled vehicles, the charging and maintenance of storage batteries has become a matter of constantly increasing importance. As a rule, the wiring in plants where storage batteries are cared for can hardly be classed as extra good. Still there are installations in which particular attention has been given to the electrical work, and the wiring in some of these is well worth consideration. In this class is the plant with which these notes are concerned.

The equipment here includes a 50-horsepower, three-phase induction motor rigidly connected to a 30-kilowatt direct-current generator, which latter machine is used to supply current employed in charging and testing storage batteries. There is a two-panel switchboard for the control of these two machines, one panel for the generator and one for the motor. On the motor panel is mounted the starting mechanism of the induction motor, an overload protective device, etc.; while the equipment of the generator panel is made up of an ammeter, a voltmeter, an automatic circuit-breaker, a double-pole, single-throw main switch, the usual type of shunt-field rheostat, and a set of pilot lights. There is also installed in the room a bank of six adjustable-resistance units and a distribution and control panel for the battery-charging circuits. On this panel there are two voltmeters, an ammeter, a six-point voltmeter selector switch for shifting a voltmeter from one set of batteries to another, six 60-ampere, double-pole, double-throw fused knife switches, and the main feed switch.

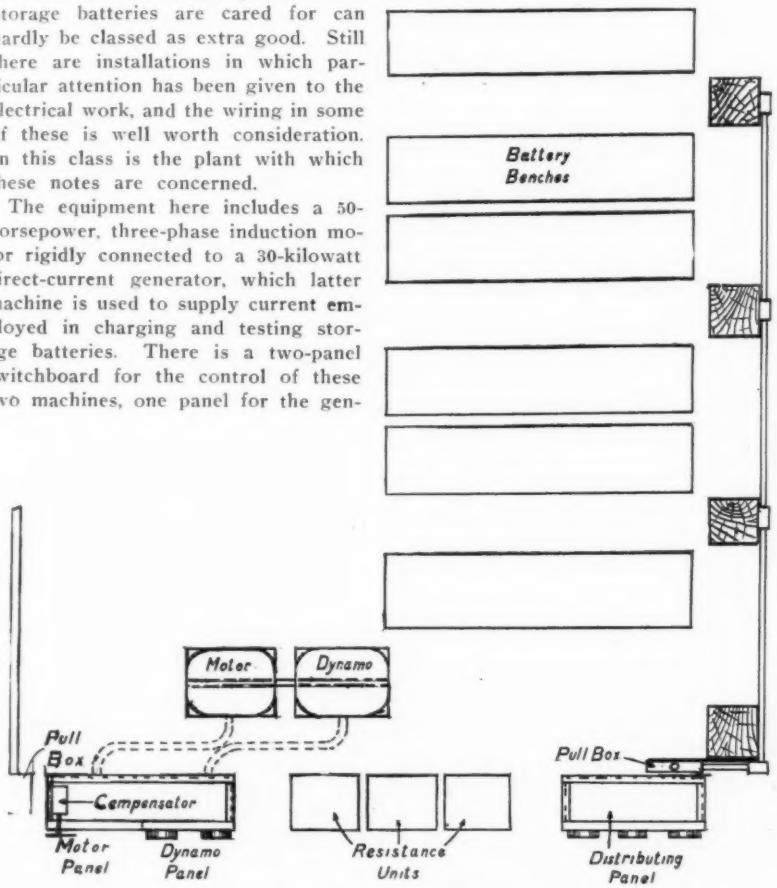


Fig. 1.—Plan of Part of Battery Room.

Fig. 1 shows the arrangement in a general way, but, in order to avoid confusion, all attempts at detail are omitted.

Three No. 0 cables in a two-inch conduit run from the service entrance along the wall of the building to a point directly above the motor panel, where they terminate in a pull-box; and from this box the wires drop vertically to the motor switch and starting compensator, the starting lever of which compensator protrudes in front of the motor panel as shown in Fig. 1. Between the motor and the starting panel the conductors are run in a conduit, in the floor, which is fitted at each end with a standard fitting having a separately bushed hole for each wire. Each of the two 250,000-circular-mil leads between swtichboard and generator is run in a 1.25-inch conduit sup-

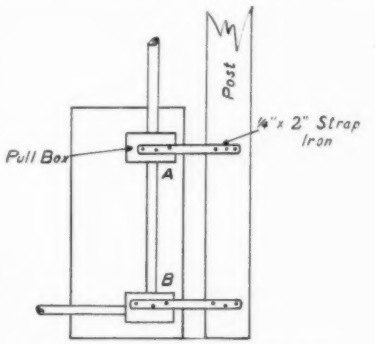


Fig. 2.—Wiring at Resistance Units.

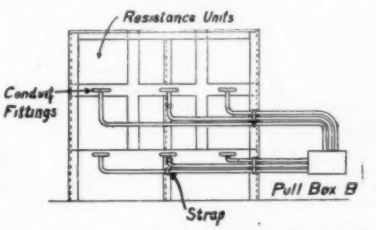


Fig. 3.—Method of Supporting Pull-Boxes on Posts.

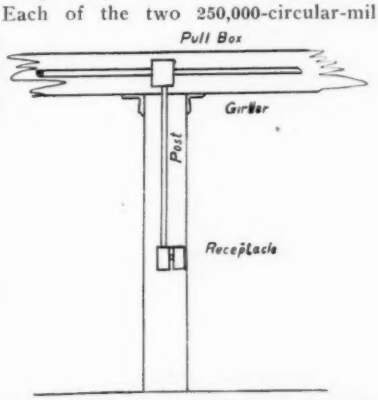


Fig. 4.—Wiring to Receptacles Where Connection is Made to Batteries.

plied at the ends with standard terminal fittings, the conduit being terminated about 12 inches above the floor at both ends. The feeders from the generator panel to the distributing panel are also 250,000-circular-mil cables run separately in 1.25-inch conduits laid in the cement floor.

The taps for the storage-battery circuits are taken off the main busbars in small straps of copper to the terminals of the 60-ampere double-throw knife switches; the return wires leading to the batteries pass back overhead and are fastened to the iron frame work of the board with spool insulators, extending thus to a pull-box mounted as shown in Fig. 2.

It may be well to explain, in passing, that double-throw switches are used on the distributing panel so as to make it convenient to cut the ammeter in circuit with any set of batteries at will.

From the pull-box *A* in Fig. 2 the wires to the resistance units are carried in a two-inch conduit to another pull-box *B*, from which the separate leads are carried in one-inch conduits up to and between the resistance units, to points as near the binding posts on these units as it was practicable to take them.

Supports for the one-inch conduits were obtained by strapping the pipes to the frame work on which the resistances are mounted. This part of the installation is especially worthy of note; for as a rule there is althogether too much unsupported construction in locations of this kind.

The final supply circuits to the battery locations consist of No. 6 wires run in two-inch conduit from the pull-box *A* (Fig. 2), this conduit extending along the ceiling beams to a post on either side of which there are benches where batteries are set to be charged or tested.

These benches are made of impregnated maple wood, with two by four-inch hardwood legs and diagonal braces also impregnated.

At the tops of the post mentioned above, the two-inch conduit enters a small pull-box, from which two circuits are carried downward in inch pipe to an iron box, as shown in Fig. 4. This box contains a 60-ampere plug receptacle, and to the terminals of this, one pair of wires is connected, the other pair passing through a porcelain-bushed nipple to the receptacle terminal.

The conduit on the ceiling extends on to another post, where the construction just described is repeated.

No. 6 twin-wire portable cable, of the reinforced type, is used for the extensions to the batteries, each end being equipped with a plug, one to attach at the post and the other at the battery table.

The portable receptacles at the batteries are provided with two lugged flexible connections about 12 inches long, for making easy and quick connection to the battery-charging terminals.

It is evident that an installation like this will not require much in the way of maintenance. It is mechanically good; it complies with Code rules; it is convenient.

Power-Factor Simply Defined.

The writer once heard a man say, in commenting upon the behavior of a new type of engine that had been installed to drive an alternating-current dynamo, that the engine ran well enough under light load but that he feared it would not run well "when some power-factors" were put on the alternator. While there are probably very few electricians who would make so awkward a statement as that one made, there are more than a few good practical men to whom the quantity termed the power-factor of the circuit or of the electrical appliance is a rather mystifying sort of thing.

In dealing with direct-current circuits or apparatus the question of power-factor does not enter. Here the power——expressed in watts or kilowatts——may be found by taking the product of volts and amperes. Thus, if a direct-current motor operating at 220 volts takes 100 amperes on full load, the power required to run this machine fully loaded is 22,000 watts, or 22 kilowatts. Or, to look at the matter in a somewhat different way, the current required by say a 500-watt incandescent lamp designed to burn at a pressure of 110 volts is found by dividing 500 by 110; that is, the current is a little over 4.5 amperes.

Alternating-current calculations, however, are not generally so simple. In an alternating-current circuit the pressure, or voltage, and the current alternate in direction at a rate determined by what is known as the *frequency* of the circuit, the frequency depending upon the speed and the number of field poles of the generator supplying the circuit. For example, the statement that the frequency of a circuit is 60 cycles per second means that the current in the conductors is changing its direction 120 times each second, or 7,200 times a minute. A 60-cycle alternator is one that will supply a current that will reverse its direction at this rate when the machine is driven at its rated speed; a 60-cycle induction motor is one that must be connected to a 60-cycle circuit, of the proper voltage, in order to secure operation at the rated speed and current.

The manner of variation in an alternating-current circuit is roughly as follows: Beginning at zero value, the current rises gradually to its maximum strength in one direction along the conductor, drops gradually to zero again, reverses its direction of flow, increases to an equal maximum in the reverse direction, and sinks to zero value again. Thus what we have been calling a *cycle* is completed.

Now the variation in the voltage is similar to the current variation, and, if current and voltage pass through corresponding values at exactly the same instant, these two quantities are said to be *in phase*, and the power-factor is 100 per cent; or, as it is quite frequently stated, the power-factor is unity. Consider, for instance, any piece of apparatus—lamp, motor or heating device—connected in an alternating-current circuit: if the current in this reaches its maximum value at the exact moment when the voltage impressed on the terminals of the appliance has its greatest value in the same direction, the power-factor is 100 percent or unity. But if for any reason the maximum of current strength occurs later or earlier than the maximum voltage—that is, if the current lags or leads—the power-factor is a fraction. The value of the fraction, which is always expressed as a decimal, depends upon how long the lag or the lead interval is.

A lagging current is much more common than a leading current. The most frequent cause of lag is the presence of coils of wire in the circuit, such as are found in motors, transformers, etc. Where the receiving apparatus consists wholly of incandescent lamps, the power-factor is approximately unity.

When the power-factor is unity, or 100 per cent, the wattage in a single-phase circuit may be obtained by multiplying the current taken by the receiver by the voltage impressed upon its terminals. Under the same conditions the wattage in a two-phase circuit is twice the product of volts and amperes, if the load on the two phases is the same. For a three-phase balanced load the wattage is obtained by multiplying the product of volts and amperes by 1.732. If the power-factor is less than unity, the products mentioned must be multiplied by it to find the power in watts.

Examples.

1. The current in each one of the three leads of a three-phase induction motor is 20 amperes; the motor is running at a power-factor of 80 per cent, and the pressure between any two

leads is 2,200 volts. How much power is it taking to drive the motor?

Let P = *power*, in watts.
Then $P = 1.732 \times 2200 \times 20 \times 0.8$;
or $P = 76{,}960 = 76.96$ kilowatts.

2. A 220-volt, two-phase induction motor running at a power-factor of 80 per cent takes 20 kilowatts of power. Find the current per motor lead.

Let I = *amperes per lead.*
Then $20 \times 1000 = 2 \times 220 \times I \times 0.8$;
or $I = 20000 \div 440 \times 0.8 = 57$ *amperes.*

3. The power absorbed in a certain single-phase appliance is 1 kilowatt, or 1000 watts. The current is 10 amperes and the voltage 110. Find the power-factor.

Let p = *power-factor.*
Then $1000 = 110 \times 10 \times p$;
or $p = 1000 \div 1100 = 91$ per cent.

The last of the three foregoing examples shows that but 91 per cent of the power apparently put into the appliance in question is true power. Power-factor is sometimes defined as the ratio of true power to apparent power.

There are standard instruments on the market for indicating power-factors directly. The use of these on alternating-current switchboards is very general. Where there is no such instrument the power-factor may be determined by the use of a voltmeter, an ammeter, and an indicating wattmeter. The method of computing the power-factor from simultaneous readings of these instruments has been suggested already. For a single-phase circuit divide the reading of the wattmeter by the volts multiplied by the amperes; for a two-phase load divide total watts by twice the product of volts and amperes; for a three-phase load divide total watts by the product of volts and amperes multiplied by 1.732.

A word with reference to the rating of electrical appliances is in order here. When an alternator or a transformer is rated at so many kilowatts the rating generally means that the appliance can be depended upon to deliver the quantity of power specified without undue heating if the power-factor of the receiving circuit is 100 per cent or approximately that. It is sometimes better to rate such apparatus in kilovolt-amperes, which quantity is the product of volts and amperes divided by 1000, and is abbreviated *kva.*

It is beyond the scope of these notes to go into the numerical relation of power-factor to duration of lag or lead interval. It may be said in a general way again, however, that the power-factor decreases as this interval grows longer. For example, a choke coil may be so designed that the current in it will lag behind the voltage across its terminals by an interval which is nearly one-fourth of the time required for the current to complete the cycle of changes explained in the foregoing; and in such a case the power-factor of the coil is approximately zero, and hence the amount of power absorbed by the coil is almost negligibly small. A coil like this is sometimes very convenient for cutting down the voltage in an alternating-current circuit. By means of it the reduction in pressure can be effected with a relatively small loss in watts; whereas, if the same reduction were obtained by connecting resistance in circuit the waste of power might prove expensive.

Electric Motor and Steam Engine in Parallel

According to a writer in *Electricity*, when the conditions in an industrial plant are such that a steam-engine operating there is temporarily overloaded at intervals throughout the day, and the manager cannot be induced to substitute complete electric drive, it may prove convenient to install a motor to run on the line shaft to which the engine is connected. The writer says that in order that the latter arrangement might prove satisfactory, it would have to be arranged that the "speed regulation" of engine and motor was the same. Under these conditions, and them alone, would the two machines divide the load in proportion to their capacities. If the normal shaft speed were 200 revolutions per minute, and the engine and motor speeds 196 and 197 revolutions per minute, respectively on full load, it is clear that when the shaft ran at 198 revolutions per minute the motor would be fully and the engine only partially loaded. In other words, the full engine capacity could not be utilized without overloading and overheating the motor. The motor regulation would be made less close—*i. e.*, its speed drop on load made greater—by increasing its armature resistance in the case of a shunt direct-current motor; its series field in the case of a compound direct-current motor; or its rotor resistance in the case of an induction motor; but naturally equality of the regulation of the engine and motor is most easily secured by adjusting the engine governor till the ratio of the engine power (as determined from indicator cards) to the motor input (measured by a wattmeter) is constant at all values of the total load on the shaft. Unsatisfactory distribution of the load may be corrected by tightening the regulation of the underloaded, or slackening the regulation of the overloaded machine.

Synchronous alternating-current motors being essentially constant-speed machines, can only be mechanically paralleled with very perfectly governed engines, but, by using an induction motor, full advantage can be taken of the engine capacity, while securing instant availability of reserve power and greatly increased peak capacity, by belting the motor to the lineshaft with such a pulley ratio that when the engine runs on normal load, the motor speed is synchronous and the electrical consumption confined to the magnetizing current of the motor. As the load increases, the engine slows down, and, due to the rotor slip, the motor supplies part of the total demand. For instance, it can be arranged that four or five per cent drop in shaft speed permits an auxiliary motor to add 60 horsepower to say, 180 horsepower derived from a steam-engine of 150 normal horsepower—making a total output of 240 horsepower, or 60 per cent total overload.

In such an arrangement, it must be ensured that the engine now runs *above* normal speed, otherwise the motor runs as a generator and a present is made of energy to the supply company. Providing the governing of the engine is properly damped, quite satisfactory operation is secured. The motor steadies the demand on the engine to a remarkable degree, but it must be remembered that the electrical demand on the mains is not favorable from a central-station point of view.

Further conditions necessary to satisfactory operation are that the engine steam pressure and the frequency of alternating-current supply be practically constant, and that the motor load be observed at frequent intervals, and the engine governor adjusted as required to maintain an equitable load distribution. The motor should be installed on the end of the lineshaft remote from the engine in order to smooth out torsional oscillations, and it must not be switched in circuit till the engine is up to normal speed.

Among the Contractors.

The West Coast Engineering Company, of Portland, Ore., has recently completed the installation of power and lighting apparatus in the mills of the Hawley Pulp and Paper Company of Oregon City. This work consists of generating equipment of 250 kilowatts capacity, motors for driving paper making machinery, and the complete overhauling of the lighting of the plant, and the wiring of a new concrete mill.

The West Coast company has also just installed an electric log unloader for the Silver Falls Timber Company, and is overhauling the lighting system on the United States Government dredge *Clatsop*. It also has the contract for the complete electrical equipment of the new Government dredges *Multnomah* and *Waukiakum*, now being built at Portland.

Some Good Conduit Work.

A fault that is much too common in conduit work is due to a lack of skill on the part of the electrician who makes the bends in the pipes, or to carelessness in the performance of this job. Bends are made too short, the conduits are flattened in the bending, and the curves are not made in such a way at

Fig. 1.—Appearance of Conduits at Distributing Center During the Roughing-In.

cabinets and outlet boxes that the tubes will enter these normal to the surfaces thereof, so as to leave the locknuts and bushings fitting snugly all around.

Fig. 1 shows how a job of this sort is handled by a skillful wireman. These are conduits run from a distributing center in a large building of the fireproof type, in course of construction. Here it was a matter not only of making the bends in the unusually large number of conduits installed so as to meet the demands of good wiring, but the question of space was also an important consideration. How the conduits could have been made to occupy less room without interfering with the good construction is not apparent.

Fig. 3 also shows some good work in conduit bending. The smaller conduits run horizontally are branch-circuit conduits to outlets in the fireproof building. It is understood, of course, that the floor will be laid above these. The vertical conduits contain the feeders from the main service board, or switchboard. The method of deadending the large feeder cables which go no higher than the room shown in the figure is well worth noting. The weight of these cables is borne by one of the beams in the floor above. From an iron hanger attached to this, iron rods extend vertically downward to standard strain insulators of a substantial design, there being a rod and a strain insulator for each cable. The cable itself runs through the lower end of the insulator. After the connection was completed, the insulator and the cable near it were taped.

The National Electrical Code requires that the conductors in vertical circuits in conduit wiring be properly supported at points the distance apart of which depends upon the size of the conductor. A turn of 90 degrees in the conduit system is accepted as constituting satisfactory support, but the advisability of such a method of support for heavy cables is well open to question. Moreover, where a large number of conduits is carried up in a wire shaft of relatively small cross-sectional area, as is frequently the case in modern large buildings, such offsets in the conduit risers may be altogether impracticable. A much better plan is to carry the circuits through approved junction boxes installed at the proper intervals along the run of the risers and support the conductors within these by means of strong insulators. The Code says that a cable may be supported here on two or more insulating supports so placed that the conductor will be deflected at an angle of not less than 90 degrees and carried

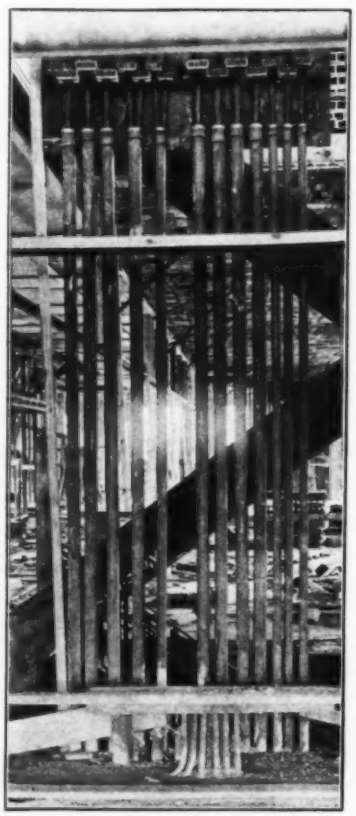


Fig. 2.—Method of Supporting Cables in Vertical Run.

a distance from its vertical position of not less than twice the diameter of the cable. Solid knobs properly installed would doubtless fulfill this requirement, but what would seem to be much better construction is that shown at the top of Fig. 2. It will be noted that the conduits are clamped in place securely with U-bolts, and that the upper ends of the

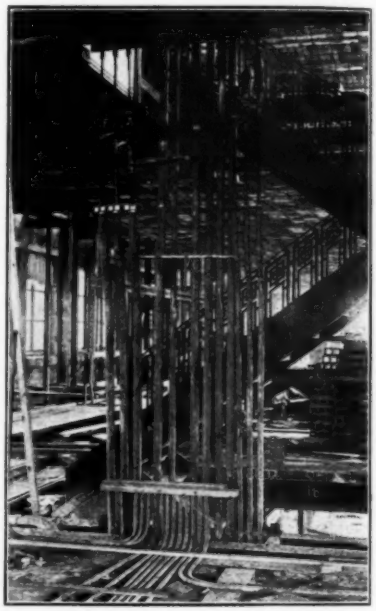


Fig. 3.—Method of Supporting Circuits at End of Run.

pipes are provided with bushings to prevent any abrasion of the insulation, while the cables are supported by means of heavy, single-wire cleats. This is a most substantial type of construction and one that is neat and compact.

Keeping Check on the Interruption of Service.

Operators in plants where motor-generators are connected to high-tension lines, on the alternating-current side, sometimes find it difficult to make up satisfactory reports covering interruptions in the service due to trouble on the high-pressure line. The difficulty usually arises from a lack of reliable data as to the beginning and duration of the interruption.

In cases of this sort I find a table like that shown herewith very useful. From a table of this sort there can be plotted a curve which is more convenient than the table itself. These data are obtained by pulling the large motor-generator off of the line suddenly, and then taking readings of the direct-current voltage at intervals that are noted and recorded as the machine is slowing down.

TABLE.

Volts.	Minutes.	Seconds.
600	0	0
500	0	50
400	1	40
300	2	30
200	3	20
100	4	10

I use this method in timing high-tension interruptions of short dura-

tion, and I find it a better method than referring to the clock to obtain the duration of the interruption. All that is necessary is to note the voltage and refer to the table to obtain the duration in minutes and seconds. By subtracting the number of minutes from the station time after the motor is on the line, the exact time of the first trouble may be obtained.

John G. Montgomery.

Testing Out the Motor Field.

In setting up a compound-wound direct-current motor, it sometimes happens that the electrician gets the leads mixed up so that he cannot be sure whether a certain connection will cause the series and the shunt coils to oppose or to aid each other. My method of testing out the field in such a case is as follows, the test being made before the machine is started up.

Having connected a few dry cells to the series winding, I hold a small compass near one of the field poles and note which end of the needle is attracted, after which I connect the battery to the ends of the shunt winding and make the same test on the same pole. If the same end of the compass needle is attracted in both tests, I know that the connection that I have used is the proper one for making the two windings of the field aid each other.

George W. Martin.

Repairing Storage-Battery Tanks.

A fairly successful way of repairing cracks in the hard-rubber tanks sometimes used as containers for the electrolyte and plates of storage cells is as follows.

The plates and electrolyte having been removed, and the rubber wall which is to be repaired thoroughly dried, a hacksaw blade is employed to widen the crack sufficiently for the insertion of an ordinary rubber band. Then a little sulphur is sprinkled over the band and a hot soldering iron applied. Thus the break is subjected to a sort of cauterizing process.

William E. Rhodes.

Soldering the Ends of Flexible Conductors.

A writer in the *Electrical Times* (London) says that at one time contractors who carried out work for Government departments were compelled to solder the ends of flexible conductors before inserting them in lamp-holders, ceiling rosettes and other fittings. By this means it was thought that stray strands liable to cause short-circuits would be avoided, and no doubt they were, but the hardened ends of the flexible proved more troublesome than the risk of an occasional burn out, fracture occurring very readily at the point where the soldering began. The practice was therefore discontinued, and it is seldom met with. A careful wireman will never leave any loose ends, and there will be no short strands if the insulation is properly cut back.

An Improvised Testing Set.

For some time I have been using the testing set shown herewith, which appliance I made myself and which I

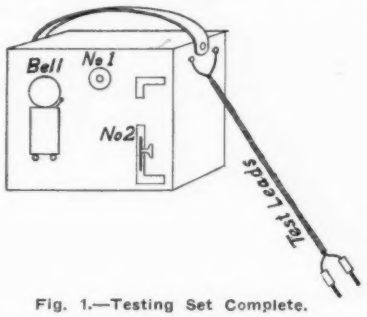


Fig. 1.—Testing Set Complete.

found to be an exceedingly useful and convenient sort of thing. The box is provided with a strap handle, so that it can be carried around steadily and the inside of it is occupied by dry cells for supplying the testing current. Mounted on the outside of the box there is a vibrating bell, a split receptacle for testing plug fuses and a pair of adjustable terminals for testing cartridge inclosed fuses. The arrangement of the bell, test leads and fuse contacts is illustrated in Fig. 2. The contacts

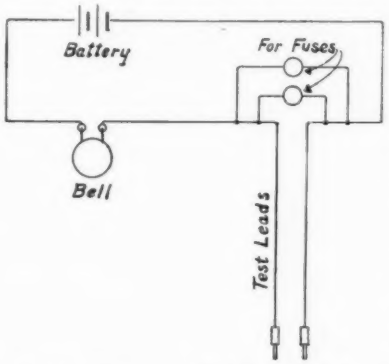


Fig. 2.—Arrangement of Circuits in Box.

for cartridge fuses can be adjusted to fit any ordinary size of fuse.

When an appliance is to be tested for open circuit all that is necessary is to place the two test points on opposite sides of the point where the break in the circuit is supposed to be; if there is no break the fact is made known by the ringing of the bell, of course. It is likewise obvious that closing either one side of the two fuse gaps will cause the bell to ring.

This box is one of the handiest things that I know of.

M. J. Morriarty.

Keeping the Knife Sharp.

Any man who has never tried it will be surprised to find how much the cutting quality of a knife may be improved by passing the blade a few times over a porcelain tube used as a whetstone. Tubes of this sort are always accessible to the wireman, and their efficiency for the purpose mentioned is excellent. I have talked to a number of wiremen who had never thought of using a tube in such a way. It is something worth knowing.

H. M. Wiest.

Formation and Growth of the National Electrical Contractors' Association.

The following excerps from the last annual report of W. H. Morton, who served as secretary of the National Electrical Contractors' Association from its formation until the first of the present month, are interesting as showing the beginnings and development of the association mentioned. The data given are taken from parts of the report that were published in the September number of *The National Electrical Contractor.*

The report goes on to say that the organization was formed in Buffalo on July 17, 1901. Charles L. Eidlitz, of New York City, was elected president, and the membership at the start consisted of thirty-one concerns. The work of the first year was largely building the foundation of the Association and increasing the membership.

The second meeting was held in Philadelphia on July 16, 1902. At that meeting Mr. Eidlitz was again elected president, and the membership had increased to one hundred ninety-six. At this time it was decided to appoint a committee to co-operate with the National Board of Fire Underwriters, and, as a result of the appointment of this committee, the Association obtained representation at the meetings of the Electrical Committee of the Underwriter's National Electric Association, membership in the National Conference on Standard Electrical Rules, and also secured the right of appeal from any improper decision of the Underwriters' inspectors.

On July 15, 1903, the meeting was held in Detroit, Mich., and Ernest McCleary of that city was elected president. During the year ending at this time the membership roll showed two hundred and thirty-one members.

The fourth annual meeting was held in St. Louis, Mo., on September 14, 1904, the date having been changed by special action of the Association so that the meeting could be held during the World's Fair. During the year preceding this meeting and the succeeding two

years, arrangements were carried on looking toward co-operation with the jobbers in reference to the sale of electrical goods at retail, but for various reasons these were not permanently successful. The membership again showed a gratifying increase, the total being 402. The election resulted in the re-election of Mr. Cleary, of Detroit, as president.

In 1905 the fifth annual meeting was held in Boston, Mass., on July 19. At this meeting, the membership roll showed 604 members, and James R. Strong, of New York City, was elected president. Important changes were made in the Constitution and By-Laws, one being that membership was vested in each concern, instead of through state and local associations, but leaving the election of directors to the state associations as formerly. A resolution was also passed prohibiting the holding of exhibitions in connection with annual conventions. At this meeting a suggestion was made by G. M. Sanborn for the adoption and printing of a set of symbols for wiring plans. This was adopted and the symbols, after endorsement by the American Institute of Architects, were printed and about five thousand copies distributed. These have been adopted by several departments of the United States Government and by the Canadian Institute of Architects, and are now an accepted standard for marking wiring plans.

The annual meeting in 1906 was held in Cleveland, O., on July 18, and the roll showed 607 members. James R. Strong was re-elected president of the association. At this meeting changes were made in the Constitution and By-Laws as follows: permitting the membership of retail dealers in electrical supplies; making dues for all members, whether affiliated with state associations or not, the same amount, and limiting the number of proxy votes for any one member to nine. During the year ending at this time the secretary, under instructions from the directors, made an extensive trip through the country visiting the membership, involving some 12,000 miles of traveling. During the same period the Association issued a small price book, showing the members where and at what prices supplies could be purchased.

The seventh annual meeting was held in New York City on July 17, 1907. At this meeting James R. Strong of New York City was again re-elected to the presidency, and the roll showed 680 members. During the preceding year Mr. Hamburger was employed as solicitor to increase the membership, and the secretary also made a trip for the same purpose, involving about 19,000 miles of traveling. At this meeting the Constitution was amended by adding a clause which permits sending to the members, as privileged communications, "Information in reference to the standing of merchants, builders and others engaged in the erecting of building or the furnishing of electrical materials therefor." This is a very valuable privilege and should be taken advantage of more often. Resolutions were adopted prohibiting the soliciting of contributions for the purpose of providing an entertainment fund for conventions, and placing the organization on record as opposing the practice of electric lighting companies doing electrical construction work in any place where there are one or more legitimate electrical contractors.

The eight annual meeting was held in Chicago, Ill., July 15, 1908, the roll showing 612 members at this time. G. M. Sanborn, of Indianapolis, was elected president for the ensuing year. During part of the year preceding, Mr. Hamburger was continued as solicitor, but the expense of soliciting, when compared with the results obtained, rendered it necessary to discontinue his work. At this meeting an important change was made in the method of nominating our officers which provided for nomination by ballot of the entire membership, and this has remained in force ever since. During the preceding year the first step was taken toward the recodification of the National Electrical Code, and E. McCleary of Detroit, Mich., was a member of a committee of five to whom was given this important work.

In 1909 the ninth annual meeting was held in Toledo, O., and G. M. Sanborn was re-elected president of the organization; the roll showed 550 members. At this meeting the plan for publishing a Universal Data and Sales Book, presented by President Sanborn, was adopted.

During the year ending June 1, 1910, three important results were obtained:

(1) The appointment of an Executive Committee by the Board of Directors, resulting in a saving of time and a more efficient management of the Association work.

(2) The completion of the work of recodifying the National Electrical Code, the revised edition having been distributed in December, 1909.

(3) The issuing of the Universal Data and Sales Book, which is probably the most valuable publication ever distributed to the contracting trade.

The tenth annual meeting of the Association was held in Atlantic City, N. J., July 20, 21, and 22, 1910. At that meeting Marshall L. Barnes was elected president, and the membership roll showed 525 members in good standing.

During the year a great deal of work was done by President Barnes to bring about closer relationship with the National Electric Lamp Association, and the National Electric Light Association.

During this period the Association collected and distributed very valuable data as to the "Cost of Doing Business," which were the first data of this kind ever obtained and which undoubtedly showed many members that they were not properly taking care of the overhead expense of their business.

On July 19, 1911, the eleventh annual meeting of the Association was held in Niagara Falls, N. Y., and the report showed 901 members in good standing, this being an increase of 376 members. At this meeting Marshall L. Barnes was re-elected president of the Association, and among the important things that were accomplished during the year were the promotion of still closer relations with other national organizations in the electrical field, the rapid increase in membership, due very largely to a strong personal effort on the part of the president, and the erection of a handsome memorial to Alexander Henderson, formerly master of transportation for the association.

At the twelfth annual convention held in Denver, Colo., July 17 to 19, 1912, the present president, Ernest Freeman, of Chicago, was elected. The membership had become 1,173.

On May 31, 1913, the membership was 1,268, and at the close of the fiscal year just ended there was a balance of cash on hand of nearly $5,000. During the past year a complete set of conduit charts has been brought out, the sale of which has been large. Some changes in these charts have been made necessary by recent changes in the National Electrical Code. There will doubtless be a continued large demand for the charts when the revisions have been made. A Universal Estimate Sheet has also been brought out. This is probably one of the most useful things ever distributed among electrical contractors. In round numbers, 40,000 of these sheets have been sold during the year.

The Association has also been instrumental in the formation of the Society for Electrical Development.

British Government statistics of the telephone trunk system in the United Kingdom show that within 10 years the number of the trunk telephone lines in use in that country has nearly trebled.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Extending the Radius of an Alarm Clock.

In a recent wiring kink there was described a method of using an alarm clock to operate electric bells in various parts of the building. Fig. 1 shows an arrangement of this sort that I have used, and which it seems to me is more satisfactory than the one described in the kink referred to.

With this scheme the edges of the alarm wind key are curved slightly so as to provide a support for one end of the hinged arm shown. When the alarm starts to operate, this key turns and drops the end of this arm, which is relatively heavy, upon a contact point immediately below it, thus closing the battery circuit and causing the bell to ring.

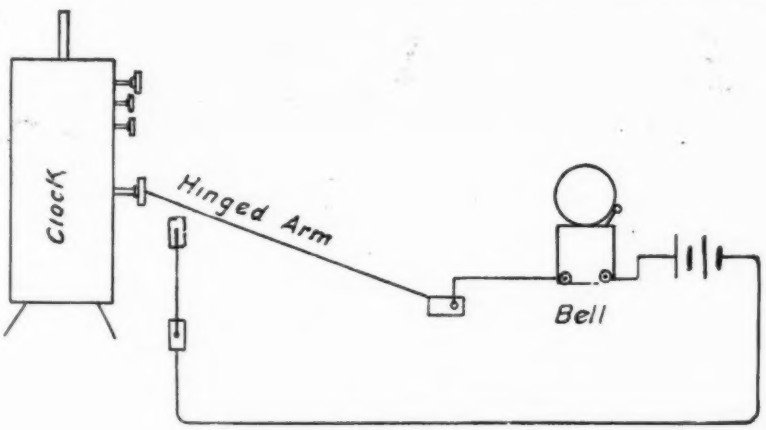


Fig. 1.—Bell Circuit.

An arrangement of this kind does not necessitate the marring of the clock in any way; in fact, the clock can be taken away and used anywhere else when the bell circuit is not to be operated.

M. J. Morriarty.

Cutting Holes in Service Cabinets.

In looking over the wiring-kink page lately I have noticed several schemes for cutting holes in service boxes. The way I proceed with this job seems to me better than any of the others.

I place the box on something solid, and use a hammer and a cape chisel with a cutting edge about a quarter of an inch wide to do the cutting. When the piece to be removed has been cut around and knocked out, I hammer around the edge of the hole to flatten the metal there, after which I smooth off the rough edge where the cutting has been done with a half-round file.

I have tried other ways of doing this job, but none of them has proved so satisfactory as the one described.

Frank Hansen.

Another Way of Cutting Service Boxes.

A great deal of my work has been in connection with the wiring of residences, and so I have had some experience in cutting holes in service cabinets, which subject I have observed some discussion of in the wiring-kink columns lately. The way I go about cutting a hole in a box is as follows:

Fig. 2.—Chisel for Cutting Hole in Cabinet.

I set the box on the end of a piece of 2 by 4-inch timber, or else put it down on a piece of lumber laid flat on the floor, and proceed to cut a hole a little less than an inch square in the box, using a half-inch chisel to do the cutting. When the square piece has been cut out a few turns with a reamer will finish the job.

This method of cutting can be employed for all sizes of conduit. When the box is laid on a board, if the chisel is turned so that it will run with the grain of the wood, the cutting will be much easier. By moving the box around, the direction of travel of the chisel can be kept constant.

J. B. Wathier.

Still Another Way.

Some four years ago I got hold of a tool that put a short-circuit on anything I had ever tried for cutting holes in service cabinets. It is what some of us call a "nosing tool," and it is used by boiler makers for cutting holes in metal. I use it regularly to cut holes for conduits and for porcelain bushings, where knockout holes have not been provided in sufficient number or in the right place. (Fig. 2.)

In cutting a hole for a conduit, for example, I take a conduit bushing of the proper size and lay out the hole by laying the bushing on the cabinet where the hole is to be and marking around the inner edge of it. Then I put the cabinet on a piece of wood and cut the hole with the chisel just mentioned and a hammer, after which I ream the hole smooth with my pipe reamer and brace, thus finishing the job.

Jack Robinson.

Removing Insulation From Stranded Conductors.

When stranded conductors are peeled in the usual way, trouble is sometimes encountered when it is attempted to scrape the rubber insulation from between the strands. My way of peeling the wire is as follows:

I run my knife around the conductor at a point as far back as I am going to remove the insulation, being careful not to cut in far enough to injure the copper strands, and then I slit the insulation from this cut to the end of the wire. Finally I start here and open up the insulation by rolling it back; the rubber pulls out nicely from between the strands leaving the wire all bright and clean.

W. H. Milligan.

Pulling Wires Into Conduit.

In pulling wires into conduits trouble is sometimes encountered from the conductors sticking at bends in the tubes. I use what I know as French chalk to overcome this difficulty. By rubbing a little of this substance, which comes in the form of a powder, on the surface of the wires the process of pulling or pushing the conductors in may be greatly facilitated.

James McCartin.

An Improvised Bit.

While working on a job located some distance from the shop the other day, I found that I had left at home the drill I needed to drill out screw holes for crowfeet on some wood mats. To get out of the difficulty I secured a 10-penny wire nail and hammered it out to a diamond shape at the point, and then filed the edges of the point so as to make it cut smoothly. This improvised tool worked very nicely.

George A. Bishop.

Among the Supply Men

Electrical Supply Jobbers Meet at Niagara Falls.

The fall meeting of the Electrical Supply Jobbers' Association was held at the Clifton Hotel, Niagara Falls, Canada, September 9, 10 and 11. There was one open session at which Douglass Burnett, vice-chairman of the commercial section of the National Electric Light Association, delivered an address on the subject of "Merchandising of Electrical Apparatus." W. E. Robertson, president of the Robertson-Cataract Company, Buffalo, N. Y., delivered an address on the organization and plans of the Society for Electrical Development. Mr. Robertson pointed out the great possibilities of the Society, and made a very interesting report on the work that had already been accomplished.

At the baseball game between the jobbers and manufacturers the jobbers won, the score being 6 to 5.

Among those present were the following:

H. C. Adams, Jr., W. J. Anderson, H. P. Andrae, A. I. Appleton, M. B. Austin, George N. Beatty, H. D. Betts, Robert C. Buell, A. Hall Berry, F. M. Bernardin, E. G. Bernard, W. S. Bissell, A. Bournonville, C. O. Baker, C. O. Brandell, L. L. Brastow, Frank R. Bryant, Fred T. Benson, W. I. Bickford, Walter Bauer, C. E. Browne, William K. Browne, W. J. Burns, Jr., J. A. Burke, S. A. Chase, W. H. Colman, C. E. Corrigan, A. J. Cole, H. B. Crouse, H. H. Cudmore, G. E. Cullinan, N. C. Cotabish, J. C. Dallen, A. D. Dana, T. M. Debevoise, W. M. Deming, A. S. DeVeau, B. B. Downs, B. M. Downs, V. R. Despard, L. O. Duclos, M. P. Ellis, A. P. Eckert, E. R. Edwards, Jr., G. W. Elliott, J. B. Estabrook, Frank W. Eastman, F. L. Funsten, A. Foster, W. F. Field, A. C. Garrison, L. V. Garron, Geo. L. Gillon, William Gloeckner, R. D. Gloeckner, E. C. Graham, H. L. Grant, H. S. Greene, Thomas G. Grier, G. B. Griffin, H. Griffin, R. E. Gorton, A. E. Howe, A. L. Hallstrom, Charles A. Harding, F. S. Hardy, G. H. Harter, H. H. Harter, John J. Hartwig, N. G. Harvey, Morton Havens, Jr., W. C. Herstein, C. L. Hight, C. W. Hobson, F. C. Hodkinson, G. F. Holly, W. F. Hoagland, P. H. Hoover, J. H. Hughes, C. P. Hill, C. R. Hunt, H. Hutchisson, B. D. Horton, H. H. Hornsby, A. F. Hills, J. G. Johanneson, E. B. Kittle, C. H. Kelley, H. W. Kilkenny, Robert Kuhn, H. B. Kirkland, B. G. Kodjbanoff, George C. Knott, L W. Kittman, P. S. Klees, H. G. Knoderer J. J. Leahy, H. R. Leonard, L. M. Levine, Herman Larson, A. Lockwood, A. B. Lyon, P. F. Lyons, G. F. Marriott, D. H. Murphy, F. D. Masterson, H. P. Moore, James B. McCarthy, J. H. McGill, M. McGraw, A. Mann, F. J. McKittrick, W. W. Merrill, A. S. Merrill, Clarke H. Methot, L. G. Mockenhaupt, H. S. Nelson, H. Nickerson, W. A. Oberlander, Thomas J. O'Brien, Franklin Overbagh, H. T. Paiste, McKew Parr, W. Parritt, Jr., J. G. Pomeroy, W. I. Patterson, George L. Patterson, John Perry, L. F. Philo, I. A. Parker, J. A. Pizzini, I. M. Post, F. S. Price, George W. Provost, James W. Perry, J. J. Raftery, E. W. Rockafellow, James Richardson, T. C. Ringgold, Warren Ripple, W. E. Robertson, C. A. Russell, W. D. Steele, B. E. Salisbury, L. A. Schwab, Charles P. Scott, E. L. Scott, G. W. Shimp, John Sherman, W. S. Sisson, G. S. Smith, B. H. Scranton, Charles J. Stahl, F. G. Skeel, F. E. Stow, Frank Stuart, A. I. Sundheimer, T. O. Strong, L. M. Taber, Frank C. Teal, W. W. Tenney, W. R. Thomas, J. D. Underhill, John F. Walsh, C. G. Walker, J. F. Ward, J. B. Ward, Albert S. Weigold, T. G. Whaling, James Wolff, M. B. Wheeler, C. F. White, E. Whittemore, R. L. Wildauer, A. E. Williams, A. B. Wilson, J. A. Worth, H. R. Worthington, Edward H. Weigle.

The next meeting of the Association will be held at Hot Springs, Va., November 18, 19 and 20.

Conference of Sales Organization of F. Bissell Company.

Sales Conference of F. Bissell Company.

The F. Bissell Company held a conference of its sales organization on August 28, 29 and 30, at Toledo, O. There was a general discussion of ideas with respect to broadening the field of influence of the company, increasing the efficiency of the selling organization, and enlarging its usefulness to the company's customers. The problems confronting each of the traveling salesmen were gone over, each man having an opportunity to tell of his experiences, following which a general discussion took place. Much enthusiasm was

manifested at the meetings, which were attended by some 40 men of the sales force and all returned to their respective territories feeling greatly benefited by the three days' conference.

The Electric Supply & Equipment Company, Hartford, Conn., reports conditions favorable for big business this fall.

H. E. Page, president of the company, has just returned from the convention of the New England Section of the National Electric Light Association, which was held at Burlington, on September 17, 18 and 19.

Public Service Commissions

CALIFORNIA.

The Western States Gas & Electric Company has been granted authority to issue $354,000 of bonds for the purpose of refunding existing indebtedness.

MASSACHUSETTS.

The twenty-eighth annual report of the Massachusetts Gas and Electric Light Commissioners has been issued for the year ending June 30, 1912.

The report reviews the orders and decisions on questions of price and quality. As a result of these the Suburban Gas and Electric Company reduced its commercial rates, the Worcester Electric Light Company was recommended to charge not more than 22 cents per lamp per night for supplying energy to 4-ampere magnetite arc lamps for street lighting in Worcester; and the Malden Electric Company's price for supplying the city's 6.6-ampere inclosed arc lamps burning all night was fixed at $85 per lamp per year, the price of the 50-watt tungstens burning all night, $18 per lamp per year, and of 50-watt tungstens burning 3,100 hours a year, $15.50 per lamp per year.

Consolidations were approved as follows: Foxboro Electric Company and Union Electric Light Company, Edison Electric Illuminating Company of Boston and Weston Electric Light Company, Boston Edison Company and Hyde Park Electric Light Company.

The Commission approved the issue by various electric companies of capital stock of $3,987,500 par value, of which $2,500,700 was of the Boston Edison Company. The value of all these securities at the price of issue was $7,729,095. The issue price of the Boston Edison Company's new stock was $215. per share.

Reductions in maximum net price during the year were as follows:

	Cents per kilowatt-hour. Formerly.	Now.
Abington and Rockland	16.2	15.
Adams	13.5	13
Amherst	16	15
Attleboro	14	13
Beverly	12	11
Buzzards Bay, Falmouth	27	17.5
Cambridge	12	10.8
Charlestown	11	10
Clinton	18	16
Edison, Boston	11	10
Gloucester	18	14
Lawrence	12.6	11.7
Leominster	15	14
Lynn	12	10
Malden	12	11
Middleton	25	15
Plymouth	16.2	14.4
Quincy	15	13.5
Salem	13	12
Suburban	13	12
Vineyard Lighting, Oak Bluffs	27	17.5
Ware	20	15.3
Williamstown	13.5	13
Winchendon	20	12

Seventeen fatal accidents were caused by electricity, and 58 other casualties. Eight of the fatal accidents were to employees of the company as were 32 of the non-fatal cases.

During the year the towns of Georgetown and Littleton began operating municipal lighting plants, current being bought of the Haverhill Electric Company and the Lowell Electric Light Corporation, respectively. The towns of Boylston and Rockland voted to construct municipal plants.

MISSOURI.

The Public Utilities Commission has been swamped with complaints regarding rates, service and standards of measurement in a large number of small electric, gas and water plants. The Commission is therefore considering the adoption of general rules for service and will call a conference, to be held some time in October, of all the electric, gas and water companies in the state for the purpose of fixing definite standards of quality.

NEW YORK.

The alleged failure of the New York, New Haven & Hartford Railroad Company to take measures to insure the protection of employees from contact with overhead electrical equipment was the subject of a joint inquiry on September 15 before Commissioner James E. Sague of the Second District and Commissioner John E. Eustis of the First District. By special invitation, also, there were present the three members of the Connecticut Public Utilities Commission, Richard T. Higgins, John H. Hale and T. B. Ford.

John Fitzgibbons, legislative representative of the Brotherhood of Railroad Trainmen, who appeared as complainant, testified that Rule 100, promulgated by the company, which forbade all trainmen getting on the roofs of cars, was in effect superseded by the company's own time-card, which required such service in certain emergencies. He admitted that it is really almost necessary for brakemen at times to be on the roofs of moving cars, for instance, when a train is backing, and the engineer depends upon the brakeman's signals. He nevertheless made a demand on behalf of his organization that the commissions at once order the New Haven road to put in force a rule similar to one of the New York Central, forbidding men to get up on the roofs of cars at all.

Clefton W. Wilder, electrical engineer to the Commission for the First District, said that in his opinion there ought to be some kind of warning of the proximity of low clearances, inasmuch as with the overhead electrical equipment used by the New Haven it was necessary to do away with the old tell-tales which gave warning of low bridges. He thought the company's rule for men to keep full 14 inches away from the high-tension wires afforded an ample margin of safety. In his opinion, the third-rail equipment is safer than the overhead type as at present operated by the New Haven. He believed, however, that the company had solved more difficult problems during the progress of its electrification than it would be to devise a proper warning of less than the standard clearance. He refused to say what kind of a sign or warning should be used, saying that was for the company's engineers to work out. Mr. Wilder also dwelt upon the fact that the constant presence of danger tends to make men callous, and even careless. This phase was also emphasized later by the company's witnesses.

C. R. Vanneman, chief of the trans-

portation division of the Commission for the Second District, also thought that there should be a warning. He said that on the Rochester Division of the Erie Railroad there is a device "something like an articulated stick" which takes the place of the old tell-tales. That is on a single-track road, however, and he would not undertake to say that it could be adapted to the needs of such a road as the New Haven.

William S. Murray, now a consulting engineer, who had charge of the work of electrification on the New Haven, testified that he regarded the overhead system as preferable, although he admitted that there were certain conditions which might justify the third-rail equipment of the New York Central. With the New Haven system, he said, there is not so much current in case of accident. Any tell-tale apparatus for a gridiron system of tracks in a yard, he said, was practically impossible, and his belief was that the company had done all it possibly could do to insure safety.

That also was the opinion of C. L. Bardo, general manager of the company, who took occasion to disavow responsibility for Order 100, which was issued before he became connected with the company. He also asserted that other employees are entitled to protection as well as the trainmen, that it is absolutely necessary to have men get on the roofs of cars, and, in fact, that they are safer there than on the ground in a busy yard. He even went so far as to declare that a man would be safer watching out for low clearances himself than to be depending upon signs, which he might overlook.

Commissioner Sague finally announced it as the opinion of the Commissions that there should be warning signs, if only for the benefit of green men. It was of the highest importance, however, that the three Commissions should agree on identical rules, and they would not be precipitate in their action. He declared the hearing closed, but suggested that while they had the matter still under consideration, the company's experts give their careful attention to the problem.

During the month of August, the Public Service Commission for the First District tested 24,339 gas meters and 13 electric meters. Of the gas meters, 122 were tested on complaint, and the results of these tests showed about 26 per cent fast and 26 per cent slow, and the balance, 48 per cent, accurate within two per cent. All of the electric meters tested were found to be accurate within the requirements of the law, that is, between 4 per cent fast and 4 per cent slow.

OHIO.

The Public Utilities Commission has authorized the Canton-Akron Consolidated Railway Company to issue five-per-cent mortgage bonds in the sum of $91,000 and transfer and deliver them to the Northern Ohio Traction & Light Company; also preferred stock of the par value of $360,000 and four-per-cent consolidated-mortgage bonds to the amount of $400,000. The Northern Ohio Traction & Light Company has been authorized to borrow $1,500,000 upon its six-per-cent serial notes. The proceeds of the above securties are to be used in paying outstanding loans contracted for the purpose of making improvements and betterments. The Commission withheld its approval for the issue of additional five-per-cent bonds to the amount of $45,000 by the Canton-Akron Consolidated Railway Company.

Jovian Campaign for Subscriptions to Society for Electrical Development Time Limit Extended.

In connection with the participation of the Jovian Order in securing subscriptions to the Society for Electrical Development, four prizes have been offered as follows: $500 in cash to the Jovian league in any city which secures the greatest aggregate number of subscriptions, not taking into consideration the total amount; cash prizes of $250, $150, and $100 to the individual Jovian securing the greatest number of subscriptions, not taking into account the total amount of these subscriptions. Many enthusiastic Jovians have reported that a great many of the men in the electrical business upon whom they have called were still away on their vacations. The Society has therefore decided to extend the time limit in the campaign from September 30 to October 10. This gives 10 days more during which the Jovian leagues and individual Jovians may work for these substantial money prizes.

At the first meeting of the season of the Chicago Jovians, held at the Hotel Sherman, Tuesday, September 16, the plans of the Society for Electrical Development were outlined by A. A. Gray, and considerable enthusiasm aroused. The Chicago Jovians are putting on a business-like campaign under the management of George C. Richards, Statesman for Illinois, and both the league as a whole and the individual Jovians in Chicago are actively at work securing subscriptions.

Illinois Coal

The production of coal in Illinois in 1912, reached the great total of 59,885,226 short tons, with a value at the mines of $70,294,338. These are record-breaking figures for the State.

LETTER TO THE EDITOR.

Catalog Designations.

To the Editor:

Will someone in the electrical trade please give me the excuse for wasting the time which we all do, looking up the 57 different catalog and trade numbers for standard wiring material and fittings, such as sockets, switches, cut-outs, etc.? The answer should come from the manufacturer; the remedy for this evil should be brought about by the co-operation which we all are beginning to recognize as the solution of most of our problems. Why do we go on doing things the same old way just because we have always done them so? Such procedure seems decidedly out of place in this day of efficiency ideas and elimination of waste, and I trust the day is not far distant when we will have a uniform designation for all articles instead of the senseless confusion now existing. I trust you will do your part in bringing about the suggested remedy.

ED. RAETZ.

Rochester, Minn., September 15, 1913.

Civil Service Examinations.

The United States Civil Service Commission announces an open competitive examination for laboratory assistant in physics in the Bureau of Standards on October 8. Vacancies are to be filled at salaries ranging from $900 to $1,200 per annum. Applicants may elect to be examined in either advanced general physics or in electricity and will be assigned as far as practicable to work in the subjects for which they are best fitted. Equal credit will be given to the results of the written examination and to the applicant's education and experience.

On October 8 and 9 there will also be an examination for heating and ventilating engineer and draftsman to fill vacancies in the office of the Supervising Architect, Treasury Department, at $1,200 per annum. This examination will cover practical questions in heating and ventilating; drawing and design; and training and experience.

Wireless Telephony on Japanese Ships.

The Toyo Kisen Kaisha (Oriental Steamship Company) has installed wireless-telephone apparatus aboard the *Shrinyo Maru* in addition to its wireless-telegraph instruments. It is proposed to test out the wireless-telephone apparatus on the Inland Sea of Japan and to continue its use if tests prove satisfactory. This wireless-telephone apapratus is the invention of Japanese engineers associated with the Japanese department of communications at Tokyo.

Park and Boulevard Lighting in Chicago.

Noteworthy Features of the Electrical Equipment.

In the active city-planning movement taken up in Chicago in the last few years it has usually been claimed that no co-ordinated plan has heretofore been followed. While this is largely true, one important exception must be noted; this is the public park and boulevard system which had its beginnings about 44 years ago and which has steadily grown until it is now probably the most comprehensive and thoroughly developed in any large city. In order to understand the reasons for the adoption of various lighting equipments for the parks and boulevards it is necessary to give a brief historical sketch of the development of the Chicago park system.

Fig. 1.—Day View of Jackson Boulevard, Chicago, Looking West from Federal Street and Showing Ornamental Tungsten-Cluster Installation.

The Park Districts.

In 1869, while the city had a population of about 295,000, wise provision was made by legislative enactment for a system of parks and boulevards within the area of not only the city proper but of what were then its sparsely settled suburbs. Since much of the area to be included was outside of the city limits, the park system was organized separately from the municipality. In fact, three distinct park districts were created, each of these comprising one of the three townships in the city and much of the contiguous outlying territory. In 1890 a great territorial expansion of the city took place by wholesale annexation of suburbs, and thus there was brought within the city limits all of the area within the three main park districts. Each of these has remained, however, as a distinct municipal body, controlled by a commission of five members and having authority to levy taxes and make rules for the control of its parks and boulevards independent of the city or county. The three main park districts are the South Park, West Park and Lincoln Park districts. As these three main park districts developed, the park and boulevard system which each had provided was brought to a high stage of perfection and gained widespread renown, so that the city came to be known as the "Garden City."

The boulevard systems of the three park districts are interconnected so as to form one principal chain of boulevards circling about the more congested portion of the city and including a chain of six large parks, which were the first to be completed.

Smaller parks were added from time to time, but about 10 years ago a more definite movement was begun to provide still more liberally for the recreation needs of the future by great extension of the park and playground system. A large number of smaller

parks were established and in these parks, known chiefly as play parks, there were built a series of both outdoor and indoor gymnasiums, shower baths, swimming pools and children's playgrounds. Most of these smaller parks were also provided with what are known as field houses, which are substantially neighborhood centers containing reading and club rooms available for various educational and social meetings, including dances. Of the smaller parks nearly 30 have been provided, within the last ten years, with gymnastic, playground and other special recreation facilities, which have proved immensely popular, since they are provided, as a rule, in the more congested districts where the supply of these facilities has been keenly appreciated. Similar facilities have also

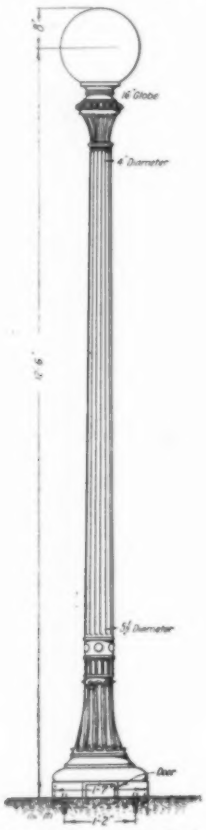


Fig. 2.—Ornamental Iron Post for New South Boulevards.

been added to nearly all of the larger parks.

Aside from the three main park commissions there is a Special Park Commission under the control of the city itself. This has under its jurisdiction 82 small parks with a total area of nearly 200 acres. These parks comprise for the most part areas of but a few acres, many of which are as yet unimproved on account of the financial condition of the city. This same commission also controls 18 municipal playgrounds, which are provided merely with a certain amount of gymnastic apparatus and equipment for children's amusement and play; these playgrounds are usually of limited

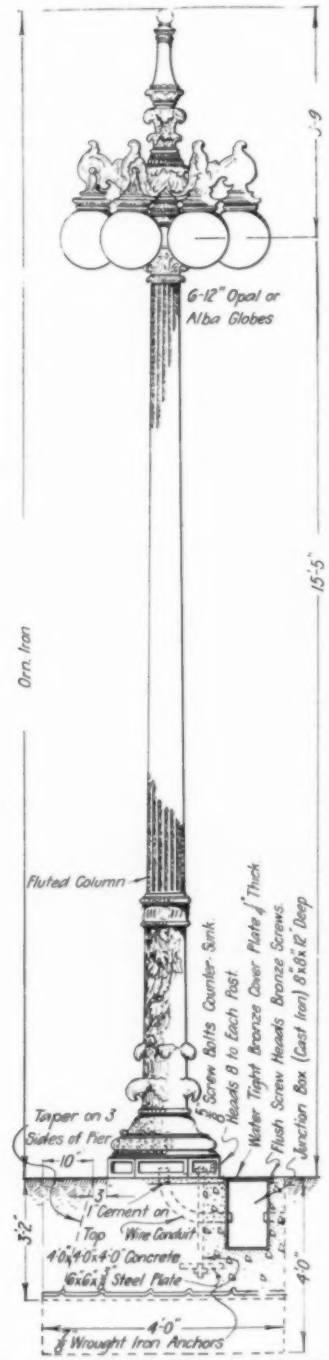


Fig. 3.—Ornamental Post for Downtown Boulevards, Showing Foundation Details.

area and being practically devoid of trees and grass, are not usually cataloged among the parks. This park commission also controls three municipal bathing beaches along the lake front. A fifth park commission exists in the city which controls one small park and about four miles of boulevards in the northern part of the city known as Rogers Park. Efforts have been made on a number of occasions to consolidate all of the park commissions under municipal control, but as yet these have been unsuccessful.

Including the 82 very small parks under the control of the Special Park Commission, there are in the city of Chicago 126 parks, of which 44 are controlled by the three main park commissions and represent almost ex-

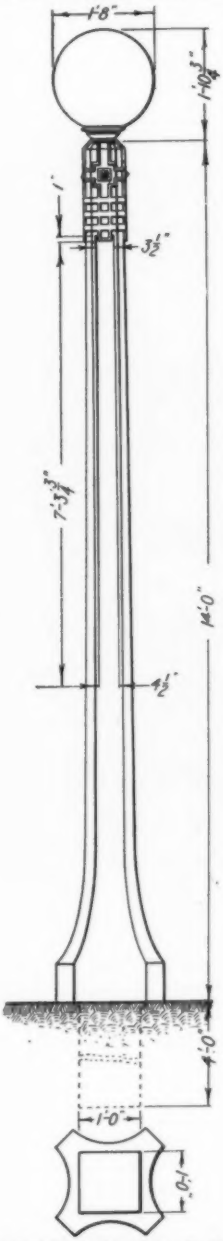


Fig. 4.—Reinforced-Concrete Post for Lincoln Park Boulevards, With Plan of Base.

clusively parks highly developed and freely used by the public at all seasons of the year. The total area of these 126 parks, including also the

boulevard system associated therewith, is about 4,440 acres. The total population of the city at the present time is estimated at about 2,380,000. Thus there is set apart one acre of park space for each 536 inhabitants.

Lighting of South Park System.

The South Park district is the largest of the three main park districts in the city. Included in this area is 92.6 square miles on what is known as the South Side of the city. The South Park system comprises 24 parks with a total area of 2,044 acres. Four of these parks have an area ranging from 200 to 543 acres. Of the remaining smaller parks, practically all are equipped with both outdoor and indoor gymnasiums, athletic fields, playgrounds, swimming pools, park buildings, including assembly halls, reading rooms, club rooms, refectories, etc. In the South Park system there is a total mileage of about 33 miles of boulevards. Since the South Park district includes the downtown portion of the city, there is available for its taxation purposes a much larger total assessed valuation than in either the West or Lincoln Park systems. Consequently the South Park system has always been more liberally provided with funds, which is reflected in both the quantity and character of the park equipment.

For the electric lighting of the South Parks there was established many years ago an arc-lighting station in Washington Park. This had an equipment of high-speed engines belted to small direct-current arc dynamos. About five years ago this plant was entirely rebuilt and equipped on strictly modern lines with a turbo-generator unit developing three-phase alternating current, some of which was transmitted to the outlying parks in which substations were established for their particular lighting needs. A few years ago the South Park Commission made a favorable contract for the supply of practically all of its electrical energy from the hydroelectric system of the Sanitary District of Chicago. Consequently the relatively new generating station just referred to was shut down and held as a reserve for either emergency service or to help in carrying peak loads. A few of the very remote small parks, particularly in the neighborhood of South Chicago, are not supplied from this system since it has not seemed advisable to lay a long stretch of cable for the relatively small load in these parks. Ultimately these will also be included in the electric system of the South Parks.

When the new power house was built in Washington Park about five years ago all of the direct-current arcs were discarded and replaced by 7.5-ampere, series, inclosed alternating-current arc lamps, these being all arranged on 50-light circuits provided with an individual constant-current regulator for each circuit. About 1,600 of these lamps are still in service in various parts of the South Park system. In the smaller parks, for the most part, the same type of lamp is used but the circuits comprise various numbers of lamps to accommodate the local conditions.

A year ago there were purchased 280 General Electric 7.5-ampere series alternating-current, inclosed carbon-flame arcs, which have been installed at prominent corners and at what were formerly danger points both in the parks and along the boulevard system. Some of these lamps are also used for the lighting of outdoor gymnasiums and playgrounds. The flame arcs are included in the same circuit as the alternating-current inclosed arcs and have been placed only where conditions demand a more intense lighting.

In two of the small parks there have been placed about 150 series tungsten lamps. These also are 7.5-ampere lamps, so as to be included in the standard circuit. These lamps are each 250-watt units and are inclosed in Alba globes.

By a special arrangement with the city of Chicago a considerable mileage of the South boulevards is lighted by the city with various types of alternating-current arc and gas lamps.

Fig. 5.—Night View of Jackson Boulevard, Looking West from Federal Building.

Along Michigan Boulevard, for instance, from Twelfth Street to Thirty-ninth Street flame arcs are used. On several of the newer outlying boulevards which have recently been converted from ordinary city streets into boulevards, gas lighting has been in use, but plans have just been concluded for beginning work in the near future on the installation of ornamental series-tungsten lamps for this purpose. It is planned to relieve the city before long of all lighting of boulevards.

The most noteworthy boulevard lighting in the South Park system is that along the two downtown boulevards: Michigan Boulevard between Randolph and Twelfth Streets and Jackson Boulevard between the river and Michigan Boulevard. On account of the fact that these portions of the boulevard system are in the central business district and serve as connections between the South Park system and that on the West Side and North Side it was determined to provide for their lighting a highly ornamental and distinctive equipment. A detailed description of this was given in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of September 16, 1911. In the Michigan Boulevard installation there are 160 ornamental posts, each bearing six 100-watt multiple tungsten lamps. They are spaced about 75 feet apart in the direction of the boulevard and are placed directly opposite each other along the curb.

The same type of equipment is used on Jackson Boulevard, as shown in Fig. 1. This boulevard passes transversely through the downtown district and bears very dense traffic. The new lighting system was installed here last spring, 84 of the ornamental posts being placed on the two-thirds mile of boulevard in question. A detailed view of the post is shown in Fig. 3. The height to the center of the lamps is 15 feet 5 inches. The total height of the posts is 19 feet 2 inches. These posts are probably the most ornamental used anywhere on any considerable scale for tungsten cluster lighting. The cost of each post itself is about $160. The circuits for this type of boulevard lighting are fed from subway transformers, the secondaries being 115-volt circuits supplying the lamps in multiple. A night view of this type of lighting is shown in Fig. 5, in which the streaks in the lower part of the picture are caused by the headlights of the numerous automobiles that passed during the long exposure necessary to take the photograph. The lighting is very uniform for the entire surface of the roadway and sidewalks and the entire installation presents a most handsome appearance, both by day and by night. The lamps being of relatively small size (80 candlepower), there is practically no glare to be observed.

Fig. 6.—New Ornamental Tungsten Posts and Field House in Fuller Park.

Fig. 7.—Sheridan Road (the North Shore Boulevard), Showing Concrete Arc-Lighting Posts.

As mentioned above, the South Park Commission is about to install an equipment of series tungsten lamps along the more southerly boulevards which were recently taken over from the city. For this purpose there will be installed a total of 869 lamps, covering about 10.4 miles of boulevard. For the most part these new boulevards are 66 feet wide. The lamps will be placed directly opposite each other and about 100 feet apart along the curb. Fig. 2 shows the type of post to be used in this equipment. It is of ornamental iron, graceful in appearance and considerably simpler in general design than the type used for the ornamental tungsten system in the downtown district. The height to the center of the lamp is 12 feet 6 inches. A general view of this type of lighting is shown in Fig. 6, this being from a photograph taken in Fuller Park, which is one of the smaller parks. The lamps are 250-watt series, 7.5-ampere tungsten lamps. They are fed from underground conduit laid in the grass plot between the sidewalk and

curb, so as to avoid tearing up the street surface.

Lighting of Lincoln Park System.

The park district on the North Side is known as the Lincoln Park system,

Fig. 8.—Day View of Flame Arc Lamps on Washington Boulevard, Looking West from Sacramento Boulevard.

this name being derived from the large park which it includes. Although the Lincoln Park district is the smallest of the three main park districts, comprising an area of but 12.64 square miles, it has parks and boulevards having a total area of about 700 acres. Lincoln Park is the oldest and probably the most popular park in the city. Including the extensions now being provided for this park, it has a total area of 552 acres. There are also five small parks in the Lincoln Park system, ranging in area from a few to ten acres each. These are of the order of the play parks referred to before and are provided with outdoor playgrounds, etc. The Lincoln Park system also includes 10.8 miles of boulevards outside of the park areas.

The Lincoln Park system is electrically lighted from a plant located near the lake shore about the center of Lincoln Park. This had originally an equipment of engines and direct-current belted arc dynamos. A few years ago this plant was entirely remodeled into a substation supplied from the Sanitary District of Chicago. The old arc lamps were all changed to series inclosed 7.5-ampere arcs. Aside from this main substation there have been established four smaller substations in four of the small parks in this system. These supply the lighting in their respective park areas.

For the lighting of Lincoln Park, aside from the driveway along the lake shore and near the zoological buildings, there are in use 330 inclosed arcs mounted on ornamental iron posts. These are partly of the harp and partly of the goose-neck pattern, the base of the posts in practically all cases being the Columbia design used during the World's Columbian Exposition in Chicago in 1893.

In 1909 experiments were made with the hope of developing a concrete post of the Daniels type suitable for use both in the parks and along the boulevards. These experiments were entirely successful and resulted in the development of the reinforced-concrete post shown in Fig. 4, which has been very extensively used and is the standard equipment for all new lighting in the Lincoln Park system. This post is of simple but graceful and dignified outline, patterned after the Egyptian obelisk. The exterior has a granite finish, which is not only durable but helps to give the entire post a pleasing appearance. The height to the center of the globe is 15 feet. The base extends four feet below the ground. A total of 614 of these posts, surmounted by entirely inclosed arc lamps, are in use, principally along Lincoln Park Boulevard, the eastern edge of Lincoln Park along the lake shore, and then northward along Sheridan Road. A day view of this latter driveway is shown in Fig. 7, which gives a general idea of the arrangement and appearance of the equipment. A detailed description of the way in which these posts are made was given in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of December 25, 1909.

An extension of this type of lighting is now being installed along Sheridan Road between Foster and Devon Avenues; 108 additional lamps of this type are to be placed in service there within a few weeks. The same type of post and equipment is used in two of the small parks, containing 21 and 33 of these posts respectively. In three other of the small parks the same type of post is used, but instead of containing inclosed arcs the lamp equipment consists of 400-watt tungsten lamps; about 60 posts are provided in this manner. All these concrete posts are very cheaply made right in Lincoln Park. For lighting

Fig. 9.—Night View of Washington Boulevard.

of gymnastic and playground apparatus, roque courts, etc., 10 multiple carbon-flame arcs are used.

A distinctive feature of the Lincoln Park boulevard lighting is that separate circuits are provided for the two sides of the roadway. One side is lighted until midnight and the other side throughout the night. On the following evening the order is reversed, so that the lamps receive about the same amount of actual use. A considerable number of isle lights are used with red globes for marking different safety islands and at points where turns occur in the boulevard system. These isle lights contain two clusters of lamps in each case, and are connected through two series transformers into the regular series arc circuits supplying the adjacent lighting; each primary is in series with the arc circuit on one side of the boulevard and each secondary supplies two 110-volt incandescent isle lamps. This avoids running a separate circuit for these lamps. Until midnight both the clusters of lamps burn, after midnight one or the other is in service. Another feature of the Lincoln Park lighting system is that an electric truck is used for trimming and cleaning the lamps, which greatly facilitates this work.

Lighting of West Park System.

The West Park district includes an area of 35.5 square miles and is the most populous of the three main park districts. This park system includes 14 parks with an area of about 640 acres and 24.75 miles of boulevards. Three of the parks are of considerable area and, having been established many years ago, are thoroughly developed. The other parks are of the small-park type and in several of them there are provisions for outdoor and indoor play and gymnastic activity, also swimming pools and neighborhood social centers.

The center of the West Park lighting system is a large building in Garfield Park, which was formerly the power house of the system. A few years ago it was converted into a substation supplied from the Sanitary District lines. All of the outdoor lighting is on 6.6-ampere, 60-cycle circuits with from 75 to 82 lamps in series on each circuit. Ninety-volt arc lamps are used and for the most part these are of the inclosed alternating-current type. About 1,100 of these lamps are in use for general main park and boulevard lighting. Along the more frequented boulevards and also at turns in the park roadways and dangerous boulevard crossings carbon-flame arcs are provided, there being in use about 350 lamps of this type. Fig. 8 shows a view of the flame-arc lighting along Washington Boulevard, and Fig. 9 gives some idea of the nature of this lighting when viewed at night. This latter illustration does not do justice to the very effective illumination and good distribution provided. The arc lamps are mounted on goose-neck posts of the type shown in Fig. 8, but about the lagoons the harp type is generally used; the mounting height is from 14 to 16 feet above ground.

In three of the small parks multiple flame arcs are used for the illumination of outdoor gymnastic apparatus and playgrounds. Two of the small parks have an equipment of magnetite luminous arc lamps. These are of the new inverted ornamental type and are operated on direct-current circuits supplied from mercury-arc rectifiers in small substations located in buildings in these parks. In these parks there are 22 magnetite arcs and more will be added in the near future to make the total 98. These lamps have given such excellent satisfaction both in their steadiness and uniform light and also in their attractive appearance, that it has been decided to adopt them for use in practically all of the small parks in the West Park system.

The most recent installation of the ornamental luminous arcs is shown in Fig. 10, which is a night view of the nearly completed swimming pools in Harrison Park, a new small park on the West Side. The shallower pool in the foreground has an area of 137 feet 4 inches by 75 feet. Behind this is a deeper pool 50 feet by 75 feet. Surrounding the pools is a walk 11 feet 5 inches wide, at the inner edge of which are mounted 10 luminous arcs on white ornamental iron posts, giving a height of 14 feet 6 inches to the center of the arc. The light distribution is quite uniform and the entire lighting effect is pleasing. Although the illustration shows the characteristic photographic halation from strong lights, which is most noticeable from the city arc just beyond the brick inclosing wall, steady viewing of the large globes of the magnetite arcs is not nearly as tiring as when more concentrated arcs are looked into.

The numerous small parks under the control of the Special Park Commission are not provided with special lighting, as a rule, the equipment being generally either of the gas type or of one of the types of arc lamps used by the city and described in the article dealing with the municipal street-lighting system in the issue of two weeks ago. Each of the three main park districts has a separate electrical department. That of the South Parks is in charge of W. I. Bell; that of the Lincoln Park system is in charge of J. W. Cairns and that of the West Park system is in charge of Frank A. Ksander.

Fig. 10.—Night View of New Swimming Pools in Harrison Park, Showing Lighting by Ornamental Luminous Arcs.

Copper Exports.

Exports of copper for the week ended September 11 totaled 8,781 tons; since September 1, 12,335 tons; same period last year 11,020 tons.

The Boston City Council has adopted an order which calls upon the Commissioner of Public Works to secure from the Edison Electric Illuminating Company an estimate of the cost of substituting incandescent electric lighting for the 11,000 gas lamps now in use. A large number of gas lamps have already been replaced by incandescents.

AMERICAN ELECTROCHEMICAL SOCIETY.

Report of Colorado Meeting, September 9-12.

The first western meeting of the American Electrochemical Society was held in Denver, Colo., during the week of September 9, and it was one of the most interesting as well as one of the most entertaining conventions of the Society. There was a splendid attendance and although the Rocky Mountain region had little to interest the Society in an electrochemical way, there was much that found the earnest attention of the visiting delegates in the study of the treatment of Western ores. In fact, this was the dominant note of the sessions, and the various trips to different plants gave a wide chance for the observation of western methods. Although great advancement has been made in this industry, western men feel that they are just getting a start that will result in great commercial results. The meeting, therefore, allowed members of the Society to glimpse what is being done in a large way in the treatment of ores and made them familiar with a branch of the Society's work that will take up much of their attention in the future and give their activities broader lines.

Denver's well known hospitality was very evident in the entertainment of her guests and from the time of the opening session at the Shirley Hotel until the conclusion of the Cripple Creek trip there was not a dull moment in the week's program. The visitors were cared for by a local committee composed of the following prominent men of Denver: H. C. Parmellee, chairman; W. W. Case, Jr., C. W. Comstock, W. H. Davis, H. C. Eastman, J. B. Ekeley, H. S. Evans, S. Fischer, O. P. Fritchle, F. S. MacGregor, J. L. Malm, G. H. Sethman, C. D. Test, H. J. Wichman and H. J. Wolf. These gentlemen looked after the comfort of the visiting delegates with unusual diligence and supervised the many trips that were made to the mountains and various plants. One of the interesting features of the week was a session on the top of Pike's Peak. I was the first session of its kind ever held by a scientic society and the members enjoyed it with much enthusiasm. Colorado is young in the Society and the delegates concluded that they would signalize the visit to the clouds over 14,000 feet above the level of the sea by forming a Colorado Section. This was the only business done at the session as it was thought that too concentrated brain work at such a high altitude would cause undesirable results. There were some in the party whose scientific leanings threatened experimentation on blood pressure to ascertain the cause of their peculiar exhiliration at such a high altitude but there were many in the crowd who insisted on making the day largely a holiday.

Tuesday Session.

Five papers were read at the opening session and they received extended discussion. J. W. Richards' short paper on "The Heat Resistivity of Graphite and Carbon" was an interesting statement of experiments conducted at the metallurgical laboratory of Lehigh University by J. P. Stokes and A. D. Jamieson. They determined the relative heat resistivities of carbon and graphite in the following manner. Two blocks each 20 by 20 by 10 centimeters were placed on each other so as to form a cube of 20 centimeters on the side. In the center a cubical cavity was made 2.5 centimeter on the side. Two passages one centimeter in diameter were then made from the outside to the inner cavity and a smaller hole five millimeters in diameter was drilled from the middle of an outside face to within one millimeter of the inner cavity. The larger passages were for the introduction of electric-light carbons passing through glass tubes which fitted tightly into the passages; the small hole was for a thermocouple (iron-nichrome) for measuring the temperatures when thermal equilibrium was reached. Currents up to 1,000 watts were used in the arc and many precautions were taken to obtain accurate results, particular care being given to running the tests long enough to reach equilibrium. Mr. Richards gave the methods of calculating the heat conductivity of the material and concluded with some facts as to other investigations along similar lines for purposes of comparison.

Edward F. Kern, in his paper on "The Electrolysis of Cyanide Solutions," dealt largely with experiments conducted by E. H. Koenig and S. E. Woodworth in the metallurgical laboratory of the School of Mines of Columbia University. The work was undertaken with the idea of determining the validity of some of the conflicting statements which were found in reviewing the literature on the electrolysis of cyanide solutions. The conclusions deduced from the examination of the vast literature on the subject were exceedingly interesting and will undoubtedly stimulate much work in this connection in the future.

The paper on "The Electrolysis of Aqueous Solutions of the Simple Alkaline Cyanides," by G. Howard Clevenger and Mortimer L. Hall, stirred up considerable interest. The paper called attention to the fact that on account of the constantly recurring proposals for the use of electric current as an aid to the extraction of gold and silver from refractory ores by the cyanide process, together with the former quite extensive use of electrical precipitation of gold and silver from cyanide solutions, the study of the decomposition of the various cyanides by the electric current is of the greatest interest.

The advantages of the electric furnace were set forth at great length and in a masterly manner in the paper presented by Dorsey A. Lyon and Robert M. Keeney, entitled "Possible Applications of the Electric Furnace to Western Metallurgy." The authors referred to an editorial printed in *Metallurgical and Chemical Engineering* for March, 1912, commenting on the statement of economists that value is created when any artificial product is turned into some form useful to the community; likewise that value is of three kinds, namely, "time value," "place value" and "form value." To illustrate this point the water of the Grand River at Shoshone, Colo., had little value before the construction of the Central Colorado Power Company; converted into electrical energy at Shoshone, it has form value, and, transmitted to Denver, place value. So it is with a large number of ore deposits in the western parts of the United States. Their location is such that at the present time they have no more value than does the water at Shoshone. Such being the case, is it possible to so treat these ores that their valuable constituents may be given a form value which enable them to command a place value, and, if so, can the electric furnace be used to advantage in doing so?

The electric furnace was not developed for the purpose of competing with the combustion furnace in the domain of ordinary metallurgy, the paper stated, but rather to do for metallurgy what it is not possible to do with the combustion furnace, either because of existing local conditions, or because a higher temperature or method of heating is required than is possible in the combustion furnace.

The paper discussed only those applications of the electric furnace which are strictly within the sphere of metallurgy and where the electric current is used as a thermal agent. It also discussed the use of the electric furnace so far as it has to do with the smelting of ores, having in mind especially those conditions to be found in the western part of this country.

As is well known of the coke charged into an iron blast furnace only about two-thirds of the same is used for producing the heat necessary for carrying on the process, while the other one-third is used as a reducing agent. Therefore, if the electric furnace is used for the smelting of iron ores, only enough carbon has to be supplied to unite with the oxygen of the ore, in other words, to reduce it and for this reason the smelt-

ing of iron ores in the electric furnace is of much importance to the Western Coast States, for there we find comparatively large iron-ore deposits but not suitable blast-furnace coking coals, and so the cost of coke makes ordinary blast-furnace smelting prohibitive. However, it is, of course, necessary to supply carbon in some form as a reducing agent and even though only one-third as much carbon is required for this purpose as is required in ordinary blast-furnace practice, it may be impossible to obtain even this amount at such a cost as will permit of the use of the electric furnace.

Another statement of deep interest in this very complete paper is the following: "Even though the electric current may cost more than coal for an equivalent heat value, the electric furnace may nevertheless be found more efficient and hence in the long run more economical than the combustion furnace, especially if the current can be used in the manner indicated. However, we do not believe that it is necessary to consider the electric furnace as a competitor of the combustion furnace, but as affording the metallurgist a furnace which will enable him to treat certain ores and to work out certain processes in a more advantageous manner than it is possible to do in the combustion furnace, or to treat ores in certain districts where, owing to local conditions, it would not be commercially feasible to treat such ores."

Other papers read at this session were "Some Aspects of Heat Flow," by E. F. Northrup, and "The Shape Factor," by Irving Langmuir.

In the afternoon visits were made to several of the big plants in Denver. At the plant of Sutton, Steele & Steele Company all had a splendid opportunity to see a model experimental mill and testing plant. Dry process of ore concentration and electrostatic separation of sulphide mineral were demonstrated with much interest. At the Western Chemical Manufacturing Company the visitors saw the manufacture of acids, anhydrous ammonia and liquid carbonic acid. Concentration of mixed sulphide ores and magnetic separation were shown. General testing of ores, concentration, flotation, cyanidation and magnetic separation were demonstrated late in the afternoon at the plant of the Henry E. Wood Ore Testing Company.

The evening was taken up with a smoker at the University Club, where the visitors met a large number of the scientific men of Denver.

Wednesday's Session.

The morning session was held at Boulder, the site of the University of Colorado, and several very interesting trips were taken in the afternoon. The first paper of the session was, "The Art of Electric Zinc Smelting," by W. McA. Johnson, in which he dealt with his subject broadly. He said that the commercial trials at zinc smelting in this country and Canada were not pronounced commercial successes. He would not claim anything more than his personal faith in his ability to operate his process on zinc-lead-copper ores, recovering spelter, base-lead bullion and copper matte in one operation at a probable handsome profit under certain conditions. It is evident, he said, that the only criterion of a successful new process is the actual production of finished product at a profit for the market under actual commercial conditions. He hazarded the prediction that electric zinc-lead smelting will ultimately have a treatment cost of as low as $6.00 per ton of ore and that the losses, exclusive of roasting losses, will be: Zinc, 40 pounds; lead, 1 pound; copper, 2 pounds; silver, 0.30 ounce; gold, 0.01 ounce, per ton of ore. For the immediate future multiply this estimate by two and we have a safe estimate of what can be done.

"The Electric Zinc Furnace" was the subject of a paper by P. E. Peterson, who stated that the electric furnace at the present time seems to hold out the only hope for improvement in zinc smelting. The possible apparent advantages are: large units, continuous feed and discharge, and the recovery of gold, silver, copper, and lead in the form of copper matte or lead bullion. The problems encountered in building a furnace to make the above advantages a reality have been many and perhaps much time and work can be saved to others by a discussion of different types of furnaces employed. Mr. Peterson gave some very elaborate figures on costs per ton of pay charge.

Another able paper read at this session was by Frank C. Mathers on "Solid, Thick Deposits of Lead from Lead-Acetate Solutions." He opened with the statement that "any soluble lead salt will give a solid, dense, coherent electrolytic deposit if the proper addition agents are used. Those solutions which do not give good deposits will do so when the proper agents are introduced." Mr. Mathers said that this theory could not be proved in all cases, but he gave full experimental proof in his paper in the case of lead-acetate solutions.

Other papers read at this session were "Simultaneous Determination of Copper and Lead with the Rotating Anode," by A. J. White, and "Rapid Refining of Copper with a Rotating Cathode," by C. W. Bennett and C. O Brown.

At the conclusion of the business session lunch was served by the University, after which the members were taken to the Central Colorado Power plant by members of the Boulder Motor Club. All returned to Denver in the evening.

Thursday's Proceedings.

The United States mint is one of the show places of Denver and the delegates were shown all through the building and saw the electrolytic refining of gold demonstrated. A visit was also made to the American Zinc Ore Separating Company, where the testing plant was inspected as well as the processes of electrostatic separation, dry jigging, and separation of complex ores. At the American Smelting & Refining Company the visitors saw lead smelting, Huntington-Heberlein and Dwight-Lloyd sinter roasting and baghouse recovery of smelter fume. No less interesting was the McKesson-Rice screenless sizing of ores, crushed rock and coal at the plant of the Screenless Sizer Company.

In the afternoon a trip was made to Golden, where the faculty of the School of Mines acted as hosts at luncheon to the delegates. It was planned to hold the luncheon on the top of the beautiful Lookout Mountain, but the rain fell in torrents and all had to stay indoors.

The first paper read at the business session was on "Electric Smelting of Chromium, Tungsten, Molybdenum and Vanadium Ores," by R. M. Keeney, who stated that these ores are found and mined in the western country but are not smelted in the locality of the mines. At present the ores are shipped East or to Europe after a concentration for smelting into a metal or a ferro-alloy. In the United States some of the ores are treated by chemical and combustion-furnace methods as well as in the electric furnace, but in Europe, where the high-temperature smelting of ores and the production of ferro-alloys has become a much greater industry than in the United States, practically all of the ores are treated in the electric furnace. The experimental work set forth in the paper was performed at the metallurgical laboratory of the Colorado School of Mines under a Carnegie Research Scholarship granted by the Iron and Steel Institute of Great Britain. The sources of other information given in the paper are notes taken by the author during a recent visit to electrometallurgical plants of Europe, and technical literature.

"Progress in Electrostatic Ore Dressing," was the title of a very instructive paper by F. S. MacGregor, in which he stated that the process has become recognized as a standard method of ore treatment. He said that the permanent field success of the process commenced with the installation by the American Zinc Ore Separating Company of a custom separating plant in the Wisconsin zinc field, separating marcasite from the blende of that region, marcasite being a good electrical conductor, blende a very poor conductor. The success then ob-

tained and which was continued has been due to three factors: (1) Use of electricity produced by commercial electromagnetic generators and transformers, whose output and potential is steady and capable of easy regulation, in the place of the very erratic frictional static machines. (2) Use of concentrated and powerful electrostatic field by means of two adjacent electrodes giving steadiness and strength to the action. (3) Use of a grounded machine constructed almost entirely of metal and, therefore, free from electrical disturbances.

In his paper on "The Transformation of Radiant into Chemical Energy," S. C. Lind said that in a previous paper before the Society he presented some evidence in support of the existence, in gas reactions taking place under the ionizing influence of certain forms of radiant energy, of an electrochemical equivalence bearing a close relation to Faraday's laws of chemical action in electrolysis. This evidence has been materially added to and a complete report was recently published showing statistically for eight different gas reactions and for three reactions in liquid systems that the actual number of ions produced under the influence of alpha rays, is approximately equal to the number of molecules entering into reaction. Proceeding from this experimentally established principle, an attempt was made to explain the departure from Faraday's laws which has always been observed when the amount of chemical action produced by electrical discharge through gases is compared with the current actually passing. The discrepancy is in the direction of too much chemical action for the observed current and amounts in some cases to more than a thousand fold; i. s., instead of 96,500 coulombs per one chemical equivalent, less than 100 coulombs have appeared to suffice in some cases. In his summary he makes this statement: "The use of the term 'Applicability of Faraday's law to gas reactions' may lead to confusion especially in the case of reactions produced by electrical discharge, in which the measured current does not correspond directly to the quantity of chemical change. The term ionic-chemical equivalence in gas reactions seems preferable."

The concluding session was held at the top of Pike's Peak, where the Colorado Section of the Society was formally launched. On the following day the entire party went to Cripple Creek. They detrained near the Portland mill, which treats low-grade ore by the cyanide process, sand leaching, slime agitation, vacuum filtration and zinc dust precipitation. A number of the leading mines in the district were visited.

The twenty-fifth general meeting of the Society will be held in New York City in April, 1914.

Further Norwegian Water-Power Development Authorized.

The Norwegian Storthing has recently granted to the Nitrogen Products & Carbide Company, Limited, a company formed in England with $9,650,000 capital, a concession which will permit the development of 600,000 horsepower from Norwegian watercourses. The director of this enterprise is chairman of the Alby United Carbide Factories, a company with $2,433,000 capital, which has at Odda, Norway, what are said to be the largest carbide factories in the world.

The watercourses to be developed by the new company are at Aura, Toke, and Bleskestad Bratland, south of Trondhjem. At first 100,000 horsepower will be developed at Aura, at the Sundalsfiord near Kristansund, where factories will be built for the manufacture of cyanamide ,and its transformation into fertilizers, nitric acid, nitrite of ammonia, and other nitrogenous products. The company has obtained the rights of a patented process for producing nitric acid and nitrite of ammonia, which has been successfully used in the manufacture of explosives, and will use it at Aura.

The Nitrogen Products Company has an option on the Dettifos watercourses in Iceland, and should they be developed, as the company contemplates, 410,000 additional horsepower will be added to the company's holdings, making over 1.000,000 horsepower in all.

Russian Lighting and Heating Exposition.

The Imperial Russian Technical Society has announced an exposition of lighting, heating, and fire-extinguishing devices, to be held in St. Petersburg from November 1, 1913, to February 1, 1914. The exhibits contemplated are grouped into the following general classes:

Oil, gas and other hydrocarbon lamps: arc and incandescent lamps; electric lamps with incandescent fumes; mantels, burners, carbons, and other accessories and appliances. The purposes which these exhibits are intended to illustrate include household, public building, and street illumination; lighting for railways, engneering and mining work, factores, etc.; use in the army and navy and in aerial navigation; vehicle lighting; production of light effects in theaters, etc.; fire signaling; and for scientific work, including photography and reproduction of moving pictures, etc.

The heating section is planned to include devices for heating various premises; appliances for railway engines, steam boilers, steamships, etc.; apparatus and engines for the use of combustible gases; equipment for ventilation combined with heating; oil, alcohol, gasoline, gas, and electric appliances; soldering and igniting devices.

The fire-extinguishing section will include exhibits of sprinklers and other automatic fire extinguishers; hand apparatus; fireproof materials; fire automobiles, pumps, and steam engines; tools. rescuing appliances, and other accessories; fire signals.

Other exhibits will include chemical products for lighting, lubricating, heating, and fire extinguishing; instruments for measurng gas, electricity, steam boilers, and motors; photometric and actinometric apparatus; drawings, publications, etc., referring to the subjects of the exposition.

Electrical Resistance of Magnetized Graphite.

Magnetization affects the electrical resistance of elements in different ways, generally increasing it, but decreasing it in the case of ferro-magnetic metals. This influence is several hundred times stronger in cadmium than in tantalum and bismuth. When investigating the magnetic properties of the elements, Morris Owen, Amsterdam, found that graphite possessed exceptionally high magnetic susceptibility. It, therefore, occurred to D. E. Roberts that the electric resistance of graphite would also be very greatly altered by magnetization, and his experiments entirely confirm this assumption. They also showed, however, that different specimens of graphite behave very differently, just as Owen had found that the magnetic properties of the elements were very much affected by their purity. Roberts experimented first with ordinary lead pencils, and afterwards with prismatic bars of various graphites, the specimens being about 10 millimeters long, 1 or 2 millimeters in width, up to 0.5 millimeters in thickness, at temperatures ranging from —200 to + 200 degrees centigrade. Some of his graphites conducted nearly half as well as mercury under ordinary conditions. When the graphite was magnetized, the direction of the lines of force being at right angles to the plane of cleavage, the electric resistance for continuous currents increased by several hundred per cent in many cases, but the values fluctuated very much. As the temperature rose, the increase in resistance was generally less marked, but on the other hand it was sometimes more clearly defined.—*Canadian Engineer.*

The city of Dudley, England, is planning to sell its municipal electric light and power plant to a private corporation.

THE SOCIETY FOR ELECTRICAL DEVELOPMENT: ITS PLACE, ITS OBJECT AND ITS BENEFITS.

By Stephen L. Coles.

It is quite possible that Mr. Thomas F. Ryan had in mind the electrical industry when he recently wrote: "The growth of business has made necessary the adoption of co-operative methods."

The electrical industry has reached its present tremendous volume and vital importance in the world's economics largely through co-operative efforts in various specialized directions.

Each important division of the electrical industry has its own association, working intelligently and successfully for its members along certain lines of peculiar benefit to them.

There is at present but one general organization in the field whose membership is open to both technical and commercial men. That is the Jovian Order, composed of 12,000 individuals, allied in various capacities with the electrical industry. This order stands as a glowing example of true individual co-operation, which is fully expressed in its slogan: "All together, all the time, for everything electrical."

Until the incorporation of The Society for Electrical Development, there was no non-technical association whose membership was open to companies and corporations doing business in all branches of the electrical field.

Strange as it may seem, every organization heretofore formed by electrical men has been designed to benefit them inside their own particular class of work.

The ultimate consumer of the goods and service produced by the best engineering and inventive skill and the most highly developed manufacturing processes the world has known has been to a great extent ignored. All electrical development heretofore has been largely selfish; and the public, upon whose support the whole industry is dependent, has never been taken seriously into close affiliation.

In other words, the real vital element of a great problem has been overlooked, while detail development has received minute and careful attention.

The electrical field has gone on indomitably, perfecting principles here, refining complications there, and generally progressing at a marvelous rate; and all the time with one or two exceptions, no one thought it worth while to try to educate the public in the use of new devices, in the adaptation of the latest discoveries to special needs or in demonstrating the value of full electric service in home and factory.

There is no other instance quotable in which such success has been achieved by any industry during the development of which the public was left to guide itself to the benefits and economies provided for it.

What an opportunity! What a chance for the genuine business altruist! What an opening for establishing not only co-operation among the several divisions of a great industry, but real co-operation between that whole industry and the public at large, upon whom the industry is dependent for its full success! Is it possible to conceive a stronger appeal to the imagination and the business instinct of a body of men noted for alert progressiveness?

A few years ago this great opportunity for double service was appreciated and grasped by J. Robert Crouse, of Cleveland, who attracted to his standard a number of other equally enthusiastic pioneers with an understanding of the true meaning of co-operation.

The embryonic idea gradually took form, and after the usual vicissitudes incident to acquiring momentum experienced by every forward movement, has emerged as an entity certain to occupy a large place in the public mind and in the business policies of the electrical industry.

The Society for Electrical Development is here and here to stay, and to grow in value and in service. It has the best reason possible for existence, its field of effort is almost limitless, it is founded on correct co-operative principles, its form of government is truly representative and absolutely equitable, its requirements for financial support are extremely modest in comparison with the volume of business taxable, and the returns are sure and in true proportion to the amount of effort the Society is enabled to put forth.

The Society has but one object—"to promote and increase the use, by the public, of electric current for all useful purposes as an end in itself and as a means for increasing the demand for apparatus and supplies."

Where every effort of a thoroughly representative and perfectly balanced organization is concentrated on but one object, it follows logically that the results to its members will be greater and more cumulative in effect than when several objects are sought, causing a scattering of effort and usually a waste of energy.

The Society is a money-spending organization and can, under no circumstances, become a money-making scheme. Its board of directors receives no remuneration and pays its own expenses. The only salaried officials are the general manager and the secretary-treasurer, who report to the Executive Committee, which is appointed from the board of directors, who hold office through the votes of the membership. The vote of the small member is exactly equal to that of the largest company in the Society.

Outside of the two salaries mentioned, and those of the necessary office force, the entire income of the Society will be used in the various campaigns and in the furtherance of the several plans which have been approved by the board of directors as best suited to accomplish the one object of the Society.

In five months the Society has received 412 applications for membership from manufacturers, central stations, jobbers and contractors, covering pledges for subscriptions approximating $140,000. The Society wisely has decided not to begin its work until $200,000 has been pledged. Active campaigns are now being conducted to procure this amount as quickly as possible.

What company or organization doing business in the electrical field can afford to withhold its support from a representative organization with such a commendable object, the accomplishment of which is bound to result in largely increased business for every individual member?

The Hot Springs Fire.

The public utilities of Hot Springs, Ark., suffered a severe loss when nearly one-third of the city—55 blocks—was destroyed by fire Friday, September 5. The Citizens Electric Company's power plant burned soon after the fire started, throwing the city into darkness, and shutting down the traction service on account of lack of power. Every effort is being made to rush electrical equipment there for the early resumption of service, which is expected in about twenty days. Meanwhile a detachment of United States troops, supplemented by the state militia, are guarding the city from looting.

The Federal Light & Traction Company, 60 Broadway, New York, owns the Citizens' Electric Company, the Consumer's Gas Company, Hot Springs Street Railway Company, and Hot Springs Water Company, having acquired these properties in March last.

The fire started in a negro shack in Church Street, about four blocks east of the Government Army and Navy hospital. The latter was not destroyed. This section of the city is composed mostly of frame buildings and, being dry as tinder from the long drouth, these proved ready fuel for the flames. Although the fire department responded quickly, the flames were soon beyond control and swept across streets into the business district.

The power plant was in flames within two hours after the fire started. General Manager Stephen E. Dillon and his assistants managed to save the records of the company, which were in the general offices adjoining the power plant proper. What records were not brought out before the fire reached the building were placed in the vaults and remained intact.

Great bravery was displayed by the power-house engineers who remained in the power plant to handle the electric service for the pumps pumping the water supply from the distant reservoir. They left only when the fire was upon them, and escaped without much injury.

The auxiliary steam pumps at the water works two miles distant had been put into service in the meantime and there was no delay in supplying the fire lines with water. Though there had been no rain for several weeks, the reserve capacity of the Hot Springs Water Company's reservoirs was sufficient to keep excellent pressure on during the fire. This is the only thing that saved the balance of the city. There is no danger of water famine. The reservoirs are two miles from the city proper and are fairly well filled.

Dynamiting was resorted to to prevent the spread of the fire. This saved the government bath houses, the Eastman, Arlington, Majestic and larger hotels, as well as the business section along upper Central Avenue.

The section of the city destroyed by the recent fire is the same part that was devastated in 1906. At that time, however, the power plant was not burned and the city was only temporarily without light, heat and power.

After the central station had been destroyed the fire continued on its course, eating its way into the very best part of the Hot Springs business section.

Shortly after sun-down it was thought that the entire city was doomed, when suddenly the course of the wind shifted, and the fire-fighters by heroic efforts checked the course of the fire.

A generous downpour of rain proved a valuable aid to the weary workers among the smoldering ruins and the scattered batches of fire were soon put out. It was estimated that about 60 per cent of the fire damage was covered by insurance, although no authentic figures can be obtained.

A hurried survey of the power house when the fire had cooled down showed that the 1,250-kilowatt turbine could be rewound, but that the smaller units of 450 and 500 kilowatts, respectively, would probably be a total loss. The motor-generator set and rotary converter will have to be replaced by new equipment. One condenser can soon be put into operating condition but the other will be a loss. Most of the piping was destroyed. Two of the Sterling boilers can be repaired and utilized again. It is not thought that the balance of the battery of boilers can be used again.

Traction service was resumed in the city by means of two gasoline motor-busses. Mules were hitched to the lighter street cars and the best possible service under the circumstances is being given.

General Manager Dillon rigged up a temporary line from one of the larger hotel plants to the newspaper offices and the papers went to press twelve hours after the fire, missing but one edition.

The Consumer's Gas Company, one of the companies operated by the Federal Company, supplies the city with natural gas. The hotel plant generating the current for the newspapers and the hotel burns natural gas as fuel. For this reason the hotel has never abandoned its isolated plant. The reserve artificial gas plant belonging to the Consumer's Gas Company was in the path of the fire and was burned to the ground. The holders, which were empty, were merely scorched. There was little damage to the natural-gas system, as the receiving station is outside of the city limits and far removed from the fire-swept area.

While the dying embers of the fire were slowly cooling, the New York office of the Federal Light & Traction Company was a scene of activity. The executive, engineering and purchasing departments began immediate preparations to rush new equipment to Hot Springs at the earliest possible moment. The manufacturing companies were called upon to aid and telegrams were sent to all parts of the country tracing turbines and other equipment, either new or second-hand, that can be bought and rushed to Hot Springs. The manufacturing companies were not able to supply the company out of stock but aided in the outside search.

When it is considered that the whole city of Hot Springs is without electricity, some of it without telephone service, and that the early resumption of its commercial life, the protection of the city and the dismissal of the soldiers is all dependent upon the Citizens' Electric Company obtaining electrical equipment and getting it quickly, it will readily be seen that there is a necessity that the apparatus be on the ground and erected at the earliest possible moment.

It is thought that a new central station will be built on another site about a mile from the former plant. The old plant occupied space in the business section of the city which is far more valuable for business houses than as a power station.

C. C. Chappelle, vice-president and general manager of the Federal Light & Traction Company, has personal charge of the rebuilding of the power plant, etc. Lee Skipwith is handling the purchase. W. A. Haller, chief engineer and general superintendent, is in charge at the scene of the disaster. George J. Gauthier, general construction superintendent, is assistant in active charge of the two score of linemen, and others engaged in the work of rebuilding the company's property.

Spontaneous Combustion of Coal.

In a paper read before the Manchester District Institution of Gas Engineers, Mr. Kendrick mentioned that three serious fires had taken place in four years in stacks of coal at his works at Stretford, in addition to many cases of overheating, and endeavored to explain their cause. The coal was stored in three buildings. No. 1 store held 1,800 tons, and was an old retort house partly roofed, with and partly without louvres. No. 2 store held 1,400 tons and had no louvre. No. 3 held 800 tons, and had a roof of corrugated iron. In the first two coal was delivered by conveyers. In No. 3 it was hand-stacked, 14 feet high. In the other stores it was piled in pyramids 24 feet and 20 feet high, the top of the cones being 8 feet across. No. 1 shed had given most trouble. The finest slack was usually sent direct to the retorts, but much fine stuff still got into the store and filled the middle part of the piles, and to this dust and small coal the fire trouble was due.

As a result of what was observed, after each boat had been discharged, the fine dust was dug out and spread over the heap, and pipes were put in at intervals to enable the interior of the pile to be watched. Three years of immunity led to laxity, and the small stuff had not been fully dug out, and a fourth fire occurred. It was again the small coal which heated, but was not the immediate cause. Some old screened coal was buried under the new coal, and the store was filled in about six weeks to its utmost capacity. On emptying the shed, the rough coal under the slack was quite carbonised and fire was creeping under the slack. Apparently air had reached the new coal through the old tongue of open rough coal. The temperature in the tubes rose slowly to 90 degrees, then quickly to 110 degrees, with a quick

jump to 300 degrees, and it required a week to reach the fire, which had then spread considerably. As this coal was stored in the hot month of May, 1912, and was stacked quickly and was dustier than usual, these causes appear to have been active in producing fires. The numerous fires of that year were attributed by colliery agents to the fact that after the strike, coal was much crushed at the face, and was very small, and it was not clean, being hurried away quickly for use, and more probably fresher coal than usual was stacked. Freshly mined coal was more prone to heat, especially if fine. Coal as received was warmer than the atmosphere, as much as 2 to 12 degrees in summer, and 4 to 20 degrees in winter. Since a pit might have a temperature of 90 degrees, coal must start from the pit fairly warm, and if stacked too soon, too high, or in too large mass, it was prone to heat. Also, coal mined first after the strike would be damper than usual, and dampness seemed to engender fire.

Coals absorbed from one to three times their volume of oxygen, and this produced heat, and if it could occur in a thick mass the heat accumulated. Stacking in cone shape from a conveyer caused the fines to accumulate at the apex, and these were apt to fire. This system of storage was thus to be regarded with suspicion. Coal owners suggested 11 feet to 15 feet as the height of coal stacks, or a mean of 13 feet. Gas-works practice was to stack 10 feet to 30 feet. Since coal under cover cooled less slowly, it should be stored in less depths than when out of doors, whereas the reverse was the usual practice. The question of ventilation was a disputed one. Ventilate freely and carry off the heat, was advocated by some, while others said keep out all air and no heat could be generated. If this was so it would be quite safe to store in closed bunkers, exhausting the air at the top and admitting CO_2 at the base to fill the voids between the coal. In practice it appeared that coal would be reached by air enough to make it become hot. Therefore, ample air should be supplied to carry off the heat, for the oxidation would be less if the coal was cold. Yet in mines ample ventilation to remove gas had caused heating in the gob, and the checking of the air current had stopped the heating.

If a heap fired, very much water was needed to quench it, for water set up air currents to fan the fires. At Stretford they treated affected coal with strong ammoniacal liquor and only put water on unaffected coal. The summing up was that coal from different seams should not be mixed, nor should coal of different classes. Fine slacks should not be stacked at all, nor damp coal under cover. Large heaps were the more dangerous. Lumps, nuts and fines should be well mixed in stacking. Heights should be limited to 20 feet in the open, and 16 feet under cover. External sources of heat, leaking roofs, etc., should be avoided. Temperature records should be kept of coal as received and in stock, and if the heat rose to 90 or 100 degrees the top layers should be removed and carefully watched. A fired heap should not be disturbed by pushing in bars and water should not be applied to a fire, but ammoniacal liquor. Heated coal should be removed and used promptly.—*Mechanical Engineer.*

BOOK REVIEWS.

"Elementary Principles of Electricity and Magnetism." By Robert Harbison Hough and Walter Martinus Boehm. New York: The MacMillian Company. Cloth, 234 pages (5x7¼ inches), 95 illustrations. Supplied by the Electrical Review Publishing Company for $1.10.

Books treating of the principles of electricity and magnetism appear with more or less regularity, and will undoubtedly continue to do so in the future as the science develops and new principles are enunciated, or old ones modified. Most of the texts on electricity and magnetism present some physical theory concerning the ultimate nature of magnetic and electric phenomena. As early as 1761, Prokop Divis in his work on "Magia Naturalis" wrote that electricity is the soul of the elements, a prophecy of the modern electron theory. The book by Hough and Boehm makes no attempt to explain electric and magnetic manifestations, but develops the ordinary principles and relations of electricity and magnetism from definitions. It may thus be classed with the mathematical books on the subject. The branches treated are: magnetism, magnetic induction, electrostatics, electrostatic induction, capacity, electrostatic machines, electrodynamics, quantity, resistance, difference of potential, networks of conductors, electromagnetic induction, magnetic circuits, rotating coil in uniform field, coefficient of induction, alternating currents, dynamoelectric machines, and a table of the most important formulas.

The text is intended to be used in conjunction with lecture demonstrations in which the experimental facts upon which the propositions and demonstrations depend are elucidated and the correctness of the definitions exemplified. Without these preliminary lectures the usefulness of the textbook would be very doubtful. In order that a person may acquire the ability to solve new electrical or magnetic problems, he must have some realization of magnetic and electric phenomena. This he cannot obtain from mathematical demonstrations based on definitions.

Where the preliminary lectures are given, the limitations of the demonstrations can also be pointed out. The necessity for this is well illustrated by the formulas for the coefficients of self and mutual induction. The formulas derived by the authors on pages 194 and 195 give only approximately correct values. In practice, where accurate values are desired, the calculations are by no means so simple. (See *Bulletin of the Bureau of Standards*, Vol. 8, No. 1.) The book is remarkably free from errors, and will undoubtedly prove useful in physics classes where the students are acquainted with the elements of the calculus.

C. M. Jansky.

"Telephone Cables." By J. C. Slippy. Pittsburgh: J. C. Slippy. Cloth, 147 pages (4x7 inches), illustrated. Supplied by the Electrical Review Publishing Company for $2.50.

This is really a handbook, intended for telephone men who are concerned with design, construction and maintenance of cables. It contains a large number of tables and detailed instructions and information which would be found useful in handling this work. Special attention is given to such points as are likely to come up in every-day work and the aim has evidently been to make it very practical. The various chapters deal with specifications, plans, records, long-distance work, inspection, troubles and testing, and costs. The information in the last named chapter will be found especially valuable, as little upon this subject has been published. Although the book is illustrated, the illustrating has not been well done and this detracts somewhat from its appearance and value. It should, nevertheless, prove a valuable help as an every-day companion to the worker in this field.

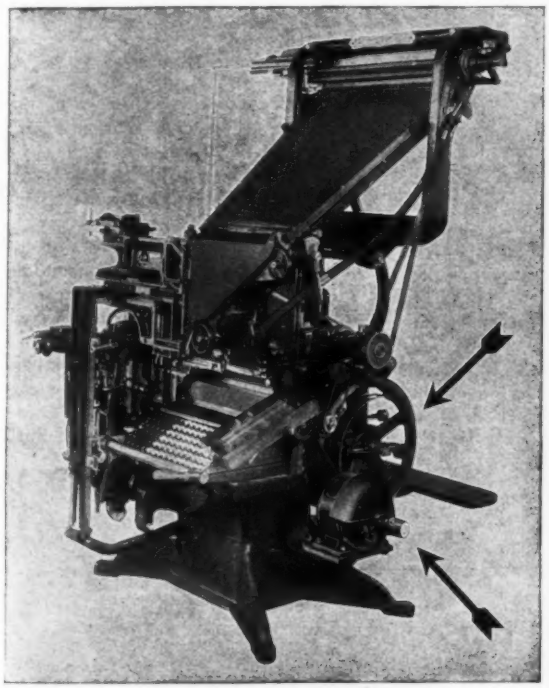
"Telephone Erection and Maintenance—A Handbook for the Contractor and Wireman." By Herbert G. White. London: S. Rentell & Company, Limited. Cloth, 129 pages (5x7 inches), illustrated. Supplied by the Electrical Review Publishing Company for 50 cents.

This volume deals with private and interconnecting telephone systems such as a contractor might be called upon to install. It does not treat of the systems using telephone exchanges such as are ordinarily in vogue for public service. The various systems which have been utilized for this class of work are taken up and explained and directions given for testing and locating faults. While the book deals with English practice, there should be no difficulty in applying the ideas to other systems after one has familiarized himself with the contents. The typographical work is fair, but it is to be regretted that calendered paper has been used.

New Electrical and Mechanical Appliances

A New Motor Drive for Intertype and Linotype Machines.

Every printer appreciates the necessity of overcoming annoyance and loss of time caused by the transposition of intertype and linotype matrices during composition. Such trouble is the invariable result of irregularities in the driving speed, due either to belt slippage with lineshaft drive, or to insufficient power or poor speed regulation with direct motor drive. A further difficulty often experienced by users of motor-driven typesetting machines is that the motors are of special construction so that it is difficult to repair them quickly if they get out of order.



Linotype Machine With New Motor Drive.

Close View of Motor Drive.

To avoid both of these troubles, the Cline-Westinghouse drive for typesetting machines has been devised. This drive can be applied to any intertype or linotype machine in a few minutes' time and without special work. The motors are built along the same lines as large Westinghouse motors, which are known for their reliability and efficiency. These motors have ample power to keep the speed steady at all times, even at the "break away" of the mold, and are very strong and rugged in construction with heavy shafts and large bearings which are automatically lubricated by oil rings. The commutator and brushes of the direct-current motor are of excellent construction, resulting in long life and freedom from repairs. A cover, as illustrated, further protects the commutator from accidental damage. Alternating-current motors have neither commutators nor brushes and therefore have no parts that require attention other than the bearings. All parts of these motors are standard and carried in stock so that repairs and renewals can easily be made.

The complete outfit consists of the following: (a) Either a single-phase alternating-current motor or a direct-current motor. (b) A hard fiber pinion to fit the motor shaft. (c) A gear wheel which replaces the belt wheel used upon standard intertype and linotype machines. (d) A bracket for supporting the motor which is easily attached to the intertype or linotype machine by means of a special cap screw which is also supplied.

Means of adjustment between the gear and the motor pinion are provided for in this drive so that accurate alinement is assured. The standard outfit is designed to drive the machine at the speed recommended by the manufacturer, but a larger pinion can be supplied for obtaining a higher speed if desired. The motors are suitable for operation on any ordinary lighting circuit of standard characteristics.

Asbestos-Wood Insulation in Plant of Elkhart Hydraulic Company.

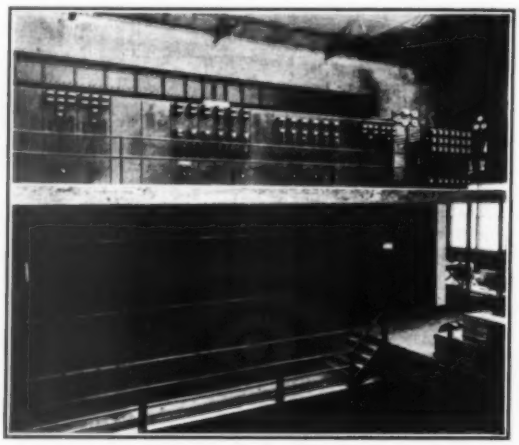
An interesting installation of the in many ways remarkable insulating material known as "J-M Ebony Transite Asbestos Wood" is in the Elkhart Hydraulic Company's hydroelectric plant at Elkhart, Ind., where a large quantity of this material is now being successfully used.

The illustration on next page shows a section of this well equipped plant. Each of the large three-panel doors is of ebony transite asbestos wood and measures 4 feet 11.75 inches by 2 feet 7.75 inches. The top row is equipped with a lower panel of wire and inserted glass to make it easier to inspect the high-tension switches without removing the doors.

Ebony asbestos wood is also used in the Elkhart company's plant for vertical and horizontal high-tension barriers, separating the high-tension switches and busbars. Both the vertical and horizontal barriers are about 24 inches wide and are of tongue-and-groove construction, eliminating any apparent joints. The horizontal busbar shelves are about 12 feet high and 2 feet wide and are built of one-half-inch material. An installation of specially cut ebony transite asbestos-wood barriers is used between the high-tension disconnecting switches in the tower of the plant, which houses the electrolytic lightning-arrester equipment.

The Elkhart company's installation is said to be absolutely fireproof. The asbestos insulating material can be shaped and machined almost as easily as ordinary wood and is cheaper to install and finish than either slate or marble. In addition to this, it is said to have qualities superior to those of slate or marble and to be equal to hard rubber or mica in insulating efficiency. It will take almost any kind of finish and may be made to resemble slate, marble or other materials. In the present case the high polish and artistic effect of this material are clearly apparent. For those who require a material for electrical purposes which combines high insulating and fireproof properties, a special black finish is furnished.

The J-M ebony transite asbestos-wood insulating material described was furnished by the H. W. Johns-Manville Company, New York City.



Three-Panel Asbestos-Wood Doors in Elkhart Plant.

U. S. Polyphase Induction Motors.

A new line of two-phase and three-phase squirrel-cage induction motors has been placed on the market by the U. S. Electrical Manufacturing Company, of Los Angeles, Cal. These are known as type FR constant-speed, riveted-frame motors and they are built in sizes from one-fourth to fifteen horsepower. The motors are made for 110, 220 and 440-volt circuits of 50 and 60 cycles.

A general view of one of these motors is shown in Fig. 1. In the smaller sizes of these machines, that is those under 7.5 horsepower, the slide-rail base is not provided but in place thereof the feet of the frame are provided with slots permitting slight movement for adjustment of belt tension.

The stator of the machine, as shown in Fig. 2, is of very rugged construction, like all parts of the entire unit. The frame is a single rigid structure composed of special steel punchings riveted solidly together between heavy end flanges. The latter have cast on them spacing fingers to provide liberal ventilating ducts on each side of the stator core. This construction makes a very light and compact machine. The stator windings are thoroughly insulated and specially treated with an insulating compound.

Fig. 1.—U. S. Polyphase Induction Motor.

The rotors for the FR motors are of substantial squirrel-cage construction. The rotor core is assembled upon a large keyed shaft and is composed of special laminated steel held together by rugged end flanges, forming a part of which are the air-directive fans noticed at the left end of Fig. 3. These fans are symmetrically placed on both ends of the rotor and provide a very effective ventilating action through and about the windings of the stator, thus keeping the machine cool even when operating under unfavorable conditions and very heavy load. The rotor bars are very heavy and are so thoroughly connected to the massive end rings as to produce a rotor of exceptionally low resistance. This results in both high efficiency and good operating characteristics in the motor. No

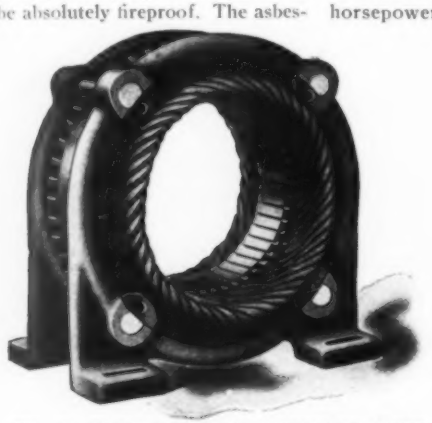


Fig. 2.—Stator of Polyphase Induction Motor.

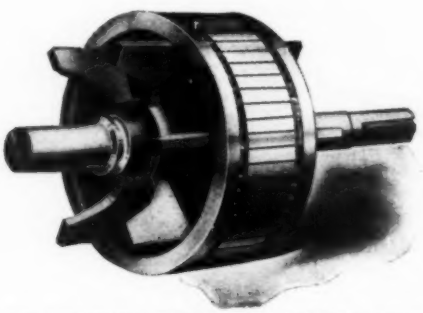


Fig. 3.—Squirrel-Cage Rotor of Induction Motor.

solder is used in the rotor construction.

The motors can be readily arranged for mounting on the floor, wall or ceiling. Large oil wells are provided for giving thorough and continuous lubrication to the bearings which are of composition white metal possessing great durability.

The company also makes a variable-speed polyphase motor, a typical one of which is shown in Fig. 4. This form of motor, which is designated as the

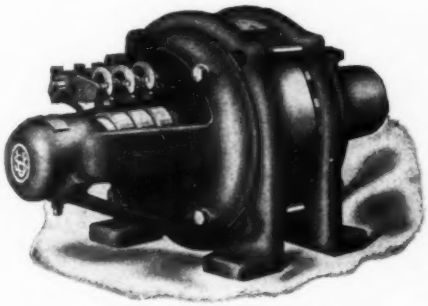


Fig. 4.—Slip-Ring Polyphase Motor.

FRV type, has heavy collector rings associated with a specially wound rotor. The stator construction is similar to that of the type FR motors and the motor throughout, like these other motors, is of rugged construction designed for severe operating conditions.

Kuhlman Outdoor Transformers.

Although it was regarded until recently as impossible to use high-voltage transformers outdoors, the improve-

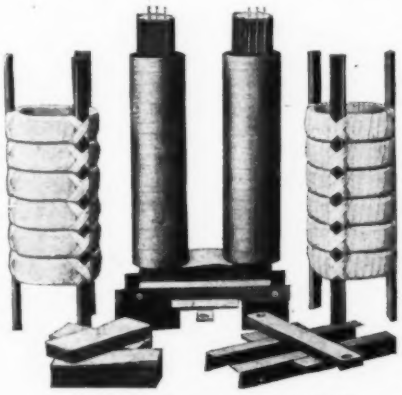


Fig. 1.—Transformer Element Partly Assembled.

ments in design made by transformer manufacturers in the last few years now make this practice not only possible but preferred for all but the larger substations.

Among manufacturers that have put on the market a distinctive line of high-voltage outdoor transformers is the Kuhlman Electric Company, Elkhart, Ind. These transformers have

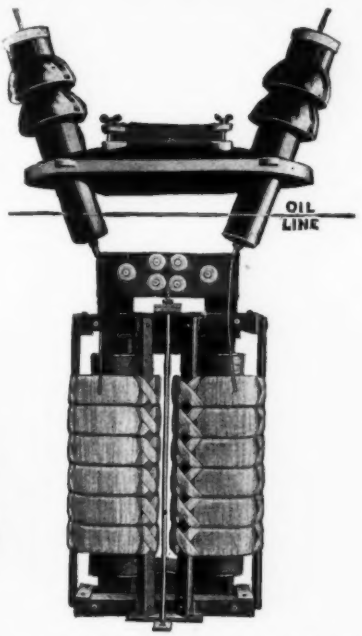


Fig. 2.—Complete Element for 33,000-Volt Transformer.

been specially designed to withstand the severe electrical and mechanical strains due to static disturbances and switching surges on the line. All features of the design are generously proportioned so that the insulation and mechanical strength of the entire unit is many times more than is actually necessary and the factor of safety therefore exceptionally high.

In order to secure great rigidity, the low-tension coils are placed directly on the cores, leaving an oil channel together with mica and vulcanized-fiber insulation between core and oil. About these coils is then placed a heavy insulating shield made of mica reinforced by rope paper, an eighth of an inch thick and uniformly and securely taped in place. Upon this tape is applied an oilproof insulating varnish to give a smooth surface to the secondary against the oil.

By means of a special construction for the support of the high-tension windings there is left at least a half-inch clear oil space between the primary and secondary coils unencumbered by spacing sticks or other elements of doubtful insulating value. Since the oil used is of extra high dielectric strength, this construction insures more than abundant insulation between primary and secondary.

The high-tension windings are subdivided into several coils, the number depending on the voltage and size of transformer. These coil sections are separately form-wound. Each high-tension terminal connects with a special terminal coil section made of relatively few turns with extra spacing and insulation. The coil sections for each leg of the transformer after being thoroughly insulated are grouped together and taped in a special cribwork or supporting frame consisting of three kiln-dried sticks provided with notches to fit the coils of each group and hold them about one-fourth inch apart. The two high-tension coil groups assembled in their cribbing are shown at the left and right of Fig. 1. Each completed group is then slipped over the secondary on its respective leg and the ends of the cribbing sticks are securely bolted to angle-iron clamps at the top and bottom, these being arranged to give the proper spacing between primary and secondary.

A view of the assembled element is shown in Fig. 2. At this stage the element is tested and then subjected to a vacuum drying and impregnating process. This removes all moisture from the insulation and wood cribbing sticks and then a highly insulating impregnation compound unaffected by oil is introduced.

Compensation taps are provided on

Fig. 3.—Outdoor Transformer, 33,000 Volts, 50-Kilovolt-Amperes.

the low-voltage coils. The high-voltage leads pass through the cover in specially insulated terminal bushings provided with several weatherproof insulating petticoats. These bushings extend well below the oil line inside. The low-voltage terminals pass through porcelain bushings in the top rim in front, where they are well separated from the high-voltage terminals.

New Pass & Seymour Receptacles.

Three new receptacles that are illustrated herewith have recently been added to the already extensive line of Fluto interchangeable receptacles made by Pass & Seymour, Incorporated, Solvay, N. Y. The new receptacles are of the key, keyless and pull types, respectively, and in each case the base is entirely covered with brass, making a neat and graceful appearance. The interchangeable feature of these receptacles is a very valuable one, as the base can be used with any of the many shells in the Fluto line; likewise the shells can be used with any other Fluto base.

New Key, Keyless and Pull Receptacles.

Fiber Conduit for Installation in Crucible-Steel Plant.

The Pittsburgh Crucible Steel Company has decided upon underground distribution in connection with its new plant at Midland, Pa. The entire system is laid out for an underground installation, using 100,000 feet of J-M fiber conduit supplied by the H. W. Johns-Manville Company. The present installation consists of some low-voltage work, some 2,500-volt lines, and some 6,600-volt lines.

Latest Approved Fittings

BUZZER.—General Electric Company, Schenectady, N. Y.

"G.E." buzzer, alternating-current circuit, 2 amperes, 125 volts, with single-pole snap switch on same base, catalog No. GE179.

Approved August 27, 1913.

CABINETS.—C. A. Johnson, San Francisco, Cal.

Approved September 2, 1913.

HEATERS, ELECTRIC.—American Electrical Heater Company, Detroit, Mich.

"American Beauty" portable heating devices for voltages up to 250. Equipped with approved heater cord and detaching plugs.

Water Heaters, 300-500 watts, with stands, catalog No. 5205.

Approved August 8, 1913.

SIGNS, ELECTRIC.—Thomas Cusack Company, Chicago, Ill.

Approved August 28, 1913.

SIGNS, ELECTRIC.—Thomas Cusack Company, New Orleans, La.

Approved August 29, 1913.

SIGNS, Electric.—Federal Sign System (Electric) of California, 257-269 Eighth Street, San Francisco, Cal.

Approved June 17, 1913.

SIGNS, Electric.—Haller Sign Works, Incorporated, 708 South Clinton Street, Chicago, Ill.

Approved June 16, 1913.

SWITCHES, Automatic.—Russell Manufacturing Company, South Bend, Ind.

"Russell" Time Switch; 60 amperes, 250 volts, double-pole.

A clock with an eight-day movement arranged to open or close a double-pole switch at predetermined times. The entire device is inclosed in a cast-iron case.

Approved July 12, 1913.

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

SWITCHES, Automatic.—General Electric Company, Schenectady, N. Y.

Type ML pressure governors for electrically driven air compressors and hydraulic pumps, 25 amperes, 600 volts.

These devices are rated standard as being in compliance with requirements of the National Electrical Code. This rating is to be understood as indicating that in their construction the electrical fire hazard has been reduced to an acceptable degree. It is not to be construed as an approval of the devices for use in connection with automatic sprinkler or similar fire protective equipment, for which services their merits have not been investigated.

Approved August 22, 1913.

SWITCHES, Knife.—Electric Apparatus Company, Chicago, Ill.

"Berthold" knife switches with fuse extensions.

200 amperes, 250 volts.
400 amperes, 250 volts.
600 amperes, 250 volts.

Approved August 15, 1913.

SWITCHES, Push-Button Flush.—Cutter Electric & Manufacturing Company, Philadelphia, Pa.

Four-way, 10 amperes, 125 volts; 5 amperes, 250 volts.

Approved July 31, 1913.

SWITCHES, Push-Button Flush.—Cutter Electrical & Manufacturing Company, Philadelphia, Pa.

Approved, July 30, 1913.

SOCKETS, Standard.—Benjamin Electric Manufacturing Company of Canada, Limited, Toronto, Canada.

"Benco" keyless, 660 watts, 600 volts, catalog No. 4200.

Porcelain shell, keyless, for fixture use only, 660 watts, 250 volts, catalog No. 109; catalog No. 692 for mogul base lamps.

Approved August 4, 1913.

SOCKETS, Standard.—General Electric Company, Schenectady, N. Y.

Pull-chain, 250-watt, 250-volt, "fluted-catch" shell, catalog Nos. GE222-GE224, inclusive.

Standard for fixture use only.

Approved August 21, 1913.

THEATER APPLIANCES.—General Electric Company, Schenectady, N. Y.

"G. E." strip lights for theater stages.

Catalog No. 78706, 10-light strip. Sheet-metal frame fitted with molded composition double-ended receptacles wired with slow-burning wire inclosed in approved metal molding.

Catalog Nos. 79822, 79823, 79824; 6, 9 and 12-light strips. Sheet-metal frame with porcelain receptacles.

Approved August 22, 1913.

VACUUM CLEANERS.—United Electric Company, Canton, O.

"Tuec" Vacuum Cleaners.

1-2 and 4-5 horsepower, 110 and 220 volts, alternating-current and direct-current.

These devices each consist of a vertical motor direct-connected to a centrifugal fan mounted on a steel cylinder. The equipment includes approved double-pole snap switches for remote control of alternating-current equipments and an approved counter-electromotive-force remote-control starter for direct-current equipments.

Standard when installed in compliance with Rule 8-c of the National Electrical Code.

Approved August 15, 1913.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

GRANTSBURG, WIS.—$9,000 bonds have been voted for an electric light system and waterworks. C.

MILTON, ORE.—The Milton City Council has decided to install an arc lighting system at a cost of $3,100.

CORNELL, WIS.—The Council will install a lighting and water system. Address the city clerk for information.

MINOT, S. D.—Bids will be received September 22 for the contract for installing the new "White Way" system here.

VERNON, CAL.—Bids will be received until October 7 for a franchise for an electric pole and wire system in this town.

FERGUS FALLS, MINN.—The city clerk will soon call for bids for a "White Way," on Lincoln Avenue and Mill Street. C.

GRAND RIDGE, ILL.—The electric light plant of the Northern Illinois Public Service Company was destroyed by fire September 3. Z.

BAGLEY, IOWA.—$6,000 will be expended for the construction of an electric light plant here. Address the city clerk for information.

SULPHUR SPRINGS, TEX.—B. F. Ashcroft & Sons, owners of the electric light system, will build an electric light and power plant.

RACINE, WIS.—The Milwaukee Electric Railway & Light Company will put all its wires in the business section underground. C.

SOURIS, MAN.—The Council will call for bids soon for the construction of an electric light plant. A 24-hour service will be installed. C.

CHARLESTON, W. VA.—M. R. Jones is arranging for the establishment of a central power plant for the service of coal mines in that section.

KEARNEY, MO.—Kearney Electric Light Company has been incorporated with a capital stock of $5,000 by Thomas H. Henderson, Lee Major and John A. Eby.

COOK, NEB.—Bonds in the sum of $6,000 have been voted here for the purpose of installing an electric lighting plant and running a wire to Tecumseh.

AUGUSTA, GA.—The City Council is considering the advisability of establishing the proposed municipal electric light plant. Address Mayor Hayne for particulars.

BEEVILLE, TEX.—Beeville Power & Light Company has been incorporated with a capital stock of $150,000 by T. W. Robertson, A. H. Murrie and C. M. Chambers.

DOWNIEVILLE, CAL.—The electric power plant at the Telegraph Mine at the head of Goodyears Creek has been destroyed by fire, the loss being estimated at $3,000.

WELLINGTON, TEX.—The Wellington Power & Light Company will develop 100 horsepower to cost $10,000. Address Joe S. Godwin, secretary, for particulars.

FOREST GROVE, ORE.—The City Council has decided that the municipal light plant will be retained and operated here, after considerable repairs and new installations made. O.

BAKER, ORE.—The city clerk here will receive bids until October 14 for the purchase of a $25,000 bond issue, which will be used in the construction of a municipal lighting plant. O.

BROOKLINE, MASS.—Improved street-lighting apparatus is to be installed in Washington Street and Harvard Square. The Boston Edison Company is to furnish the current. W.

LOS ANGELES, CAL.—Bids will be received up to October 6 for a franchise for an electric transmission line and distributing system along certain highways in Los Angeles County.

ROCKY MOUNT, VA.—The hydroelectric plant at Pelters Ford for the Rocky Mount Light & Power Company is an assured fact. The company expects to begin construction at once.

TULLAHOMA, TENN.—The Tennessee Utilities Company plans the establishment of a 20,000 horsepower water power plant on Elk River. G. K. Whitson is president of the company.

ELKO, B. C.—The Elko Power, Water & Light Company recently signed a contract with a Vancouver company to put in a new waterworks system, work to commence within two months.

GRAYSON SPRINGS, KY.—The Grayson Springs Hotel Company will require an electric light plant for a $450,000 hotel which is to be built there shortly. G. V. Newel, Chicago, is the architect. G.

CLOVERPORT, KY.—The Cloverport Ice Company has decided to spend $15,000 in the establishment of an electric light plant to be operated in connection with the factory. A. A. Simons is president. G.

STEELTON, PA.—This village will vote on a bond issue of $55,000 in November for the installation of a municipal lighting plant and it is expected that the vote will be carried by a large majority.

MEDFORD, MASS.—A new lighting system for the streets of this city is soon to be installed. In the squares there will be group lamps 50 feet apart. The new lighting contract calls for all-night, every-night service. W.

KENOSHA, WIS.—The City Council will enforce the ordinance providing that wires be placed underground. Telephone and electric light companies have been instructed to place conduits under Park Street, which has just been ordered paved.

BEACON, N. Y.—Romboua Precinct Light, Heat & Power Company, Incorporated, has been granted articles of incorporation with a capitalization of $50,000. The incorporators are John T. Smith, Samuel K. Phillips and E. Larkin Tompkins, of Beacon.

ROCKVILLE, W. VA.—Hydro-Electric Company of West Virginia, Pittsburgh, Pa., has preliminary plans to construct a dam and powerhouse on Big Sandy Creek, near this place; estimated cost, $5,000,000. 65,000 horsepower will be developed.

GAINESVILLE, FLA.—The City Council has passed an ordinance providing for the installation of a "White Way" around the courthouse square and adjacent thoroughfares in the business district, the total cost of installation not to exceed $8,290.

JACKSON, MICH.—It is said that the Commonwealth Power Company will expend $50,000 on improvements. The plans of the company include converting the power to both commercial and manufacturing uses. All wires in the city are to be placed underground.

MORA, MINN.—The Mora Electric Light Company is making preparations for enlarging its plant in order to furnish its patrons with continuous service. The company has recently secured a 20-year franchise from the village under this provision.

BIDDEFORD, ME.—A survey is being made in anticipation of the building of another power plant on the Little Ossipee River. It is said the plant will be patterned after that of the Limerick Power Company, also located on the Ossipee, and will be built at Hard Scrabble Falls.

EATONVILLE, WASH.—Bids are being received by Charles C. Biggs, town clerk, for the construction of a hydroelectric light and power plant, consisting of a concrete dam, with diverting flume, of wood stave pipe, together with turbine and power house with complete electric equipment.

CAMBRIDGE, IDAHO.—All towns along the Fayette and Idaho Northern will have electric lights and power within a year, according to the statements of Messrs. Gustad & Hill, of Grangeville, who circulated a petition, which was presented to the Utilities Commission, certifying that the improvement is a necessity. O.

LA SALLE, ILL.—The La Salle County Board of Supervisors has granted a franchise to the Citizens Light Company, of La Salle, to build a transmission line to supply power for the Jonesville mine of the La Salle County Carbon Coal Company and for the illumination of the highway. Extension of the line to the city of Oglesby is contemplated. Z.

JOHNSTOWN, PA.—Six companies to operate in Somerset county were chartered by H. H. Weaver, P. J. Morrisey and W. A. Reber, all of Johnstown, the capital of each being $5,000. Headquarters will be in this city. The companies are named for the districts in which they will operate and are Summit, Milford, Lincoln, Elklick, Black and Brothers Valley.

EVERSON, WASH.—The towns of Everson and Noonsack, as well as many farmhouses between these two towns and Sumas, are soon to be lighted with electricity from the Stave Lake plant in British Columbia. Application has been made for a franchise to put in a transmission line from Sumas to Everson, by the Sumas Electric Company. The company has applied for a franchise in Noonsack, which will be granted, and a similar right will be sought in Everson. O.

LOUISVILLE, KY.—The Board of Park Commissioners has authorized the Louisville Gas & Electric Company to erect an ornamental lighting system along Eastern Parkway, a boulevard which is being built to connect the principal parks. The Board recently contracted for standards to be placed in the parks proper and along the principal boulevards outside. The new system will cost $3,000 a year. The gas and electric company will maintain as well as erect the standards.

PORTLAND, ORE.—William H. Daly, Commissioner of Public Utilities here, will receive bids until October 6 for lighting the streets, avenues, bridges, parks, public grounds, etc., with electric arc lamps, and certain public buildings to be lighted by incandescent lamps, for a period of three years, beginning January 1, 1914, and in accordance with the specifications on file in the office of the Commissioner of Public Utilities, City Hall. Bidders may submit separate bids for the arc lighting or incandescent lighting.

SPRINGFIELD, MASS.—Plans for improved lighting of Main Street and Court Square are under way, which contemplate the installation of ten flaming-arc lamps and the use of ornamental iron poles to suport the wires of the electric railway company and of the street lighting. Superintendent of Lighting F. H. Clark and Deputy-Superintendent W. E. Hodges are working out a system which will be submitted to the supervisors. The United Electric Light Company, which furnishes energy for municipal lighting, is co-operating in the plans.

SEATTLE, WASH.—With contracts for residence lighting service piling up at the rate of 100 a day, and with increasing demands for power service upon the municipal light and power plant, Superintendent of Lights J. D. Ross recently presented reasons why a transmission line between Seattle and Tacoma, over which the latter city would provide power service, would be a paying investment. A high-power transmission line between the two cities would cost approximately $150,000, and as the matter of purchasing power is being considered by the City Council at this time, it is thought probable the deal will be put through.

PITTSBURGH, PA.—The Pennsylvania state officials granted charters on September 5 to 29 electric companies to operate in Greene, Armstrong and Washington counties. In each case the capital of the company was given as $5,000. The incorporators are E. B. Beach, C. G. Hamilton and J. McC. Reed, of this city, and H. B. Smith, Edgewood, and R. C. Lightcap, Mt. Oliver. The offices of the companies will be located in Pittsburgh, and the concerns are named for the districts in which they are to operate, being Hanover, Hopewell, Independence, West Finley, East Finley, Jefferson, Cross Creek, Clarksburg, Deemston, Cokeburg, Claysville, Beallsville, Long Branch, Ellsworth, Marianna, Wickboro, West Kittanning, Parkers Landing, Applewold, Washington, Perry, Madison, North Buffalo, Hovey, East Franklin, Boggs and Brady's Bend.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

BRISTOL, TENN.—The Bristol Telephone Company will place its telephone cables underground.

BISMARK, N. D.—The Fort Nerthold reservation is soon to have a telephone line. E. B. Baker is to be in charge of work.

REDLANDS, CAL.—The Southwestern Home Telephone Company is preparing to install a system to serve the Yucaipa Valley.

TOLEDO, WASH.—The Rainy Valley Telephone Company has been granted a franchise for a line from Fulton Ferry to Randle.

MINTO, N. D.—Construction work will soon begin on the new farmers' telephone line known as the Harrison Telephone Company, John Popowski is president.

FOLEY, ALA.—The Baldwin County Producers Corporation will purchase the South Baldwin Telephone Company's system, and improve and extend it.

RICHMOND, CAL.—The City Council is preparing to install an automatic fire-alarm and police-signal system. Address the city clerk for desired information.

MONMOUTH, ILL.—The Warren County Telephone Company has been incorporated with a capital stock of $40,000 by Harry R. Jewell, E. C. Crane and others.

BIRMINGHAM, ILL.—The Guinea Mutual Telephone Company has been incorporated with a capital stock of $1,000 by O. O. Robinson, Howard Hilyer and others.

BIRMINGHAM, ILL.—The Guinea Mutual Telephone Company has been incorporated with a capital of $1,000. The incorporators are O. O. Robinson, Howard Hillyer and Elva Higgins. Z.

CENTRALIA, WASH.—The Hanaford-Skookum Telephone Company has been granted a franchise for a telephone line from the northern boundary of Lewis County to the city limits of Centralia and up the Hanaford Valley.

ALPENA, MICH.—The Onaway Alpena Telephone Company will make application to the Michigan Railroad Commission for permission to issue bonds in amount sufficient to make much needed improvements to the system. The company will install a switchboard. Address J. M. Clark, manager, for further information.

ELECTRIC RAILWAYS.

(Special Correspondence.)

MARSHALL, TEX.—The Marshall Traction Company will extend its street railway to the Turney Park.

SAN RAFAEL, CAL.—A street railway franchise over certain streets in this city has been granted to S. J. Norton.

KEWANEE, ILL.—A fund of $1,000 is being raised here for a preliminary survey for an interurban railway between Kewanee and Rock Falls. Z.

MARSHALL, MINN.—The Luce Short Line Electric Railroad Company has raised $7,000 at Ivanhoe and proposes to build a line into South Dakota west from Ivanhoe.

MIDDLESBORO, KY. — Dr. W. Godfrey Hunter is planning the establishment of a street railway and interurban railway system. The Middlesboro Board of Trade is co-operating in the move. G.

COLUMBIA, S. C.—That a branch of the Columbia-Augusta trolley line is to be built from Johnston to Greenwood by way of Edgefield has been announced by G. E. Shand, engineer of the proposed road.

BIWABIK, MINN.—G. C. Mausdslay announces that the car line will be extended here next spring and seeks a franchise to furnish electric current to the village. J. N. Simmons, Aurora, also seeks a franchise for the same purpose. C.

OMAHA, NEB.—The McKinley system, buyers of the Ralston car line, will rebuild its power line wholly from South Omaha to Ralston, and build a new line on down the Platte to Louisville. $100,000 will be expended. Address H. W. Chubbuck, manager, Peoria, Ill.

BRADENTOWN, FLA.—C. A. Matson has been granted a franchise to construct and operate railway lines on streets of Bradentown. It is proposed to build a branch to Braden Castle, another in the Palma Sola Peninsula and a third to Cortez.

FRESNO, CAL.—The Fresno-Hanford & Summit Lake Interurban Railway Company has been granted authority by the Railroad Commission to issue $358,000 worth of bonds, the proceeds to be used for building the first unit of the road from Fresno to Selma.

SHIPPENBURG, PA.—The Shippenburg, Newburg & Western Railway Company has been incorporated with a capital stock of $100,000 to construct and operate an electric line ten miles long. The incorporators are Levi I. Weast, of Shippenburg, G. B. Watson and others.

INDIANAPOLIS, IND.—Indianapolis, Linton & Vincennes Traction Company has been incorporated to construct an interurban between Indianapolis, Linton and Vincennes. The incorporators of the company are Gilmer Bray, Charles Parker and William C. Thompson.

EBURNE, POINT GREY, B. C.—Negotiations are being conducted by the Council to secure a right of way through the flats alongside the North Arm of the Fraser River with the object of opening up that part of the district for industrial purposes by the construction of a roadway and electric tram-line. O.

SAN JOSE, CAL.—The Railroad Commission has rendered a decision directing the San Jose Railways to reconstruct as a standard gauge line its present narrow-gauge system from San Jose to Toyon station on the road to Alum Rock Park, a distance of four and a half miles. Work is to be completed within a year.

BAY SHORE, N. Y.—The Suffolk Tracktion Company, which has acquired the interest of the defunct South Shore Tracktion Company in the trolley line to West Sayville, and which has been granted a franchise by the town authorities of the town of Islip, will at once extend its line to Bayport, and continue its tracks on to West Sayville just as soon as possible.

GRAND RAPIDS, MICH.—An electric railroad, crossing Michigan from Detroit to Grand Rapids, is a promise for the near future with work to begin next spring. H. M. Wallace of Detroit is the promoter. He claims to have obtained capital from England and Boston and to have the necessary franchises and rights of way from the limits of the two terminal cities.

COLFAX, IOWA.—Right of way has been secured for a new route for the city of Colfax interurban line. Estimates of cost are being prepared on the proposed extension of the interurban from Colfax to Newton and some decision will be reached as soon as they are complete. Address C. F. Hewitt, general manager of the company, for information in regard to this project.

VANCOUVER, B. C.—From good authority comes the information that the British Columbia Electric Railway contemplates the construction of an electric interurban from Westminster to Bellingham, via Sumas, Wash. It is asserted that nothing definite will be done in regard to construction for several months, but that plans for the proposed improvements are being prepared at this time. O.

BRIDGEBURG, ONT.—Directors of the Dunnville, Wellandport & Beamsville railway which has a capital of $400,000, are now engaged in selling the balance of $200,000 worth of bonds, the funds to be used for starting at once the continuation of the traction line, which has been delayed for a long period. The line has been graded for 13 miles and ties have been distributed for 12 miles. The proposed route of the line will be from Port Hope, Ont., *via* Dunville, Welland and Thorold, on through the fruit district. U. L. Upson of Indianapolis, Ind., has been engaged as general manager and will superintend the work of construction.

TEMPLE, TEX.—It is announced by A. F. Bentley, president of the Southwestern Traction Company, that his company will soon file an amendment to its charter increasing its capital stock to $3,500,000. The company owns the interurban electric railway that runs between Temple and Belton, and is planning construction of two extensions, one to Austin, a distance of about 80 miles, and the other to Waco, about 30 miles. It is stated that the financing of the proposed extensions has been accomplished in New York. The surveys and right of way have been arranged and it is expected construction work will soon be started. D.

FINANCIAL NOTES.

The San Francisco Gas & Electric Company, a subsidiary of the Pacific Gas & Electric Company, has drawn by lot and will retire $100,000 face value of its $7,250,000 30-year 4.5-per-cent general mortgage bonds at 105 and accrued interest November 1.

Halifax Electric Tramways stockholders have authorized the issue of 6,000 shares of its capital stock, which increased its capitalization by $600,000. This is the balance of the capital stock which can be issued under the charter of the company as extended at the last session of the provincial legislature, and the proceeds of the new stock are to be used for extensions and improvements to the tramways system.

At a special meeting of the San Joaquin Light & Power Company the stockholders approved the action of the directors in providing for an issue of $1,875,000 two-year six-per cent collateral-trust notes dated August 1, 1913. These notes have been sold to bankers for the company and the proceeds will be used in extension and development work and to reimburse the treasury for capital expenditures made from income. The notes are secured by the deposit of first-mortgage bonds of the company. San Joaquin Light & Power will have outstanding $9,287,000 of bonds and notes when these notes are issued.

Dividends.

American Public Utilities Company; regular quarterly of 0.5 per cent on the common and 1.5 on the preferred, payable October 1 to stock of record September 15.

Brockton & Plymouth Street Railway; semi-annual of $3, payable September 15 to stock of record September 11.

Canadian General Electric Company; semiannual of 3.5 per cent on preferred and quarterly of 1.75 per cent on common, payable October 1 to stock of record September 15.

Capital Traction Company, of Washington; quarterly of 1.5 per cent, payable October 1.

Carolina Power & Light Company; regular quarterly of 1.75 per cent on the preferred stock, payable October 1 to stock of record September 23.

Central States Electric Corporation; regular quarterly of 1.75 per cent on the preferred stock, payable October 1 to stock of record September 10.

Cincinnati Street Railway Company; quarterly of 1.5 per cent, payable October 1, to stock of record September 16.

Columbus Lighting & Heating Company; quarterly of 1.5 per cent on preferred and 1.25 per cent on common, payable October 1 to stock of record September 10.

Dallas Electric Corporation; semiannual of $2.50 on second preferred and $8 semiannual on first preferred, payable October 13 to stock of record September 20.

Duluth Superior Traction Company; regular quarterly of one per cent on its preferred stock and one per cent on the common, payable October 1 to stock of record September 20.

Mohawk Valley Railway; regular quarterly of 1.5 per cent, payable October 1 to stock of record September 24.

Montana Power Company; quarterly of 1.75 per cent on preferred, payable October 1 to stock of record September 15.

Montana Tramways; semiannual of 2.5 per cent on debenture stock, payable October 1.

West End Street Railway Company; the regular quarterly dividend of $1.75 a share on the common stock, payable October 1.

West Penn Traction & Water Power Company; a quarterly preferred dividend of 1.5 per cent, payable September 15.

Narraganset Electric Light Company; quarterly of $1, payable October 1 to stock of record September 15.

National Gas, Electric Light & Power Company; a quarterly dividend of 1.5 per cent on the preferred and one per cent on common, both payable October 1.

New Orleans Railway & Light Company; quarterly of 1.25 per cent on preferred, payable September 30 to stock of record September 19.

New York State Railways; regular quarterly of 1.25 per cent on preferred, and 1.5 per cent on common, payable October 1 to stock of record September 22.

Otis Elevator Company; regular quarterly of one per cent on common and 1.5 per cent on preferred, payable October 15 to stock of record September 30.

Pacific Telephone & Telegraph Company; regular quarterly of $1.50 on preferred, payable October 15.

Philadelphia Traction Company; semiannual of $3, payable October 1, to stock of record September 12.

Southerly Utilities Company; quarterly of 1.75 per cent on preferred, payable October 1 to stock of record September 18.

Toronto Railway; quarterly of two per cent, payable October 1, to stock of record September 15.

Twin City Rapid Transit Company; regular quarterly of 1.75 per cent on the preferred and 1.5 per cent on the common, payable October 1 to stock of record September 18.

United Gas and Electric Corporation; regular semiannual of three per cent on the preferred stock to stock of record September 15.

United Utilities Corporation; regular quarterly of 1.75 per cent on preferred, payable October 1, to stock of record September 20.

Washington, Baltimore & Annapolis Railroad; quarterly of 1.5 per cent on preferred, payable September 30 to stock of record September 20.

West Jersey & Seashore Railroad Company; regular semiannual of 2.5 per cent, payable October 1 to stock of record September 15.

Western Union Telegraph Company; regular quarterly of 0.75 per cent, payable October 15, to stock of record September 20.

Reports of Earnings.

PUGET SOUND TRACTION LIGHT & POWER.

Puget Sound Traction, Light & Power reports earnings for June, 1913, and the twelve months ended June 30, 1913, as follows:

	1913.	1912.
June gross	$ 683,957	$660,647
Net after taxes	281,394	273,757
Surplus after charges	109,432	109,452
Twelve months, gross	8,377,565	
Net after taxes	3,476,094	
Surplus after charges	1,450,000	

PENSACOLA ELECTRIC COMPANY.

The comparative statement of the Pensacoal Electric Company for the month of July and the twelve months ended July 31, 1913, is as follows:

Month of July—	1913	1912
Gross earnings	$ 24,545	$ 24,389
Net earnings	8,902	9,697
Surplus over charges	2,135	3,319
Jan. 1-July 31—		
Gross earnings	$285,988	$285,100
Net earnings	104,455	105,812
Surplus over charges	27,313	34,774

CONSOLIDATED GAS OF BALTIMORE.

The Consolidated Gas Electric Light & Power Company of Baltimore reports for the year ended June 30, 1913, compared as follows:

	1913	1912
Total increase	$6,114,973	$5,465,187
Net	3,151,792	2,822,399
Surplus after charges	1,675,025	1,405,122
Dividends	810,672	744,750
Depreciation	460,000	455,527
Special residue	300,000	.....
Balance	104,352	204,857

BOSTON EDISON.

The income statement of the Edison Electric Illuminating Company of Boston, for the year ended June 30, 1913, shows net earnings of $2,807,153, against $2,591,626, the previous year. The income account compares as follows:

	1913	1912
Gross	$6,365,874	$5,787,345
Expenses	3,558,721	3,195,718
Net	$2,807,153	$2,591,626
Miscellaneous income	103,957	74,969
Total	$2,911,010	$2,666,595
Interest	390,065	242,860
Balance	$2,520,945	$2,423,735
Miscellaneous charges	147,929	18,483
Balance	$2,373,016	$2,405,252
Dividends	1,950,333	1,872,444
Surplus	$422,683	$532,808

E. W. CLARK & COMPANY PROPERTIES.

Companies under operating management of E. W. Clark & Company report earnings for July, 1913, and the twelve months ended July 31, 1913, as follows:

UNION RAILWAY, GAS & ELECTRIC CO.

	1913	1912
July gross	$ 362,267	$ 330,434
Net after taxes	164,710	133,885
Surplus after charges	66,775	42,971
Twelve months gross	4,577,407	3,508,476
Net after taxes	2,012,436	1,469,232
Surplus after charges	864,483	651,298
Balance after preferred dividends	549,483	336,473

BANGOR RAILWAY & ELECTRIC CO.

July gross	$ 72,090	$ 64,300
Net after taxes	40,542	35,467
Surplus after charges	23,250	18,909
Twelve months gross	743,480	664,244
Net after taxes	405,945	364,051
Surplus after charges	200,344	182,082
Balance after preferred dividends	*95,344	77,082

*Equivalent to 4.8 per cent on the common stock.

PORTLAND RAILROAD.

July gross	$ 120,011	$ 111,584
Net after taxes	61,059	52,529
Surplus after charges	43,034	35,783
Twelve months gross	1,015,907	972,529
Net after taxes	304,769	278,469
Surplus after charges	*178,487	154,443

*Equivalent to 8.9 per cent on the capital stock.

LEWISTON, AUGUSTA & WATERVILLE RAILWAY.

July gross	$ 75,102	$ 67,637
Net after taxes	35,054	32,804
Surplus after charges	19,503	18,356
Twelve months gross	657,469	609,838
Net after taxes	251,022	226,369
Surplus after charges	75,786	52,932
Balance after preferred dividends	39,786	16,932

GRAND RAPIDS RAILWAY.

July gross	$ 117,688	$ 111,191
Net after taxes	44,683	49,021
Surplus after charges	29,608	34,459
Twelve months gross	1,270,319	1,212,028
Net after taxes	526,825	536,245
Surplus after charges	348,872	359,956
Balance after preferred dividends	273,872	284,956

CHATTANOOGA RAILWAY & LIGHT CO.

July gross	$ 95,521	$ 94,055
Net after taxes	38,161	36,536
Surplus after charges	13,283	14,290
Twelve months gross	1,162,587	1,005,956
Net after taxes	468,496	406,560
Surplus after charges	184,762	152,686

MANILA ELECTRIC RAILROAD & LIGHTING.

The Manila Electric Railroad & Lighting Corporation reports earnings for the twelve months ended June 30, 1913, compared as follows:

	1913	1912
Gross earnings	$1,644,339	$1,526,269
Net after taxes	874,834	849,145
Surplus after charges and sinking fund	569,009	543,549

ATLANTIC GAS & ELECTRIC COMPANY.

The Atlantic Gas and Electric Company has issued its report for the year ended July 31, 1913, compared with that for the twelve months ended March 31, 1913, as follows:

Year ended—	Mch. 31, '13.	July 31, '13.
Consolidated income of subsidiary gas and electric properties	$1,080,500.42	$1,117,538.85
Net surplus from said subsidiary Co.'s income resources available for A. G. & E. Co.	201,773.61	208,642.70
Other income	63,027.45	65,497.42
Total gross income resources	$264,801.06	$274,140.12
Expense deduction.	27,785.04	28,414.90
Net income resources	$237,016.02	$245,725.22
Interest on $2,000,000 of 5% series "A" bonds	100,000.00	100,000.00
Balance	$137,016.02	$145,725.22
Dividends on $1,750,000 of 6% cumulative pref. stock	105,000.00	105,000.00
Balance	$32,016.02	$40,725.22

NEW YORK RAILWAYS COMPANY.

The annual report of the New York Railways Company for the fiscal year ended June 30, 1913, makes a good showing.

The income account for the fiscal year follows:

Revenue from street railway operation	$14,065,158
Operating expenses	8,146,252
Taxes	1,169,895
Income from operation	4,749,010
Non-operating income	410,029
Gross income	5,159,040
Deductions, including rentals and interest on underlying bonds	2,695,555
Net income available for interest on the company's bonds	2,463,485
Interest on 4 per cent refunding mortgage and 5 per cent adjustment mortgage bonds	1,542,002
*Net income (surplus)	621,482

*Includes reserves imposed upon the company by order of the Public Service Commission now in litigation.

The principal feature of this year's report is the large expenditures for improvements made and authorized during the year, approximately $2,500,000. Most of those expenditures were not sufficiently advanced to be of any material advantage to earnings during the past fiscal year.

KEYSTONE TELEPHONE.

	1913	1912
August gross	$105,267	$101,128
Net after tax	50,056	48,525
Surplus after charges	26,538	23,049
Eight months gross	837,106	799,779
Net after tax	412,614	396,409
Surplus after charges	209,833	195,369

AURORA, ELGIN & CHICAGO.

	1913	1912
June gross	$ 184,786	$ 181,426
Net after taxation	81,477	84,174
Surplus after charges	48,520	51,385
Twelve months gross	1,955,723	1,845,488
Net after taxation	790,863	762,288
Surplus after charges	402,622	381,463

WESTERN RAILWAYS & LIGHT.

	1913	1912
Three months gross	$ 606,762	$ 538,734
Net after taxes	220,070	193,688
Surplus after charges	67,003	58,276
Twelve months gross	2,439,503	2,258,886
Net after taxes	924,620	839,578
Surplus after charges	345,504	317,085
Balance after preferred dividends	165,399	167,175

PORTLAND (ORE.) RAILWAY, LIGHT & POWER.

	1913	1912
July gross	$ 568,371	$ 580,557
Net after taxes	293,997	298,902
Surplus after charges	112,619	157,887
Twelve months gross	6,671,029	6,511,361
Net after taxes	3,358,171	3,275,545
Surplus after charges	*1,476,022	1,626,559

*Equivalent to 5.9 per cent on the $25,000,000 capital stock outstanding.

EAST ST. LOUIS & SUBURBAN.

	1913	1912
July gross	$ 230,716	$ 197,978
Net after taxes	88,676	84,709
Surplus after charges	39,073	36,534
Twelve months gross	2,597,892	2,338,573
Net after taxes	1,142,030	1,036,117
Surplus after charges	556,170	469,985
Balance after preferred dividends	206,170	119,985

Balance after preferred dividends for twelve months ended July 31, 1913, was equivalent to 2.9 per cent on the outstanding common stock.

CUMBERLAND COUNTY POWER & LIGHT.

	1913	1912
July gross	$ 235,247	$ 216,795
Net after taxes	119,733	103,255
Surplus after charges	61,058	49,856
Twelve months gross	2,232,000	2,084,840
Net after taxes	1,004,676	842,751
Surplus after charges	324,101	228,869
Balance after preferred dividends	210,101	183,869

Balance after preferred dividends for year ended July 31, 1913, was equivalent to 7.8 per cent on the outstanding common stock.

ST. JOSEPH RAILWAY, LIGHT, HEAT & POWER.

	1913	1912
July gross	$ 105,701	$ 98,335
Net after taxes	45,250	40,171
Surplus after charges	25,183	20,589
Twelve months gross	1,223,982	1,142,078
Net after taxes	535,537	457,497
Surplus after charges	296,341	223,014
Balance after preferred dividends	218,341	145,014

Balance after preferred dividinds for twelve months ended July 31, 1913, was equivalent to 6.2 per cent on the outstanding common stock.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Sept. 15.	Sept. 8.
American Tel. & Tel. (New York)	131⅛	130⅞
Commonwealth Edison (Chicago)	148	148
Edison Electric Illuminating (Boston)	260	260
Electric Storage Battery common (Philadelphia)	49¼	47¾
Electric Storage Battery preferred (Philadelphia)	49¼	47¾
General Electric (New York)	148½	144
Kings County Electric (New York)	119	119
Manhattan Transit (New York)	1½	1½
Massachusetts Electric common (Boston)	14	14
Massachusetts Electric preferred (Boston)	69	71
National Carbon common (Chicago)	118	118
National Carbon preferred (Chicago)	113	113
New England Telephone (Boston)	146	145
Philadelphia Electric (Philadelphia)	23¼	23
Postal Telegraph and Cables common (New York)	80	83
Postal Telegraph and Cables preferred (New York)	66½	66½
Western Union (New York)	68	67
Westinghouse common (New York)	73⅝	72⅛
Westinghouse preferred (New York)	115	114

PERSONAL MENTION.

MR. ARTHUR L. COOK, formerly of Westinghouse, Church, Kerr & Company, has been appointed to the professorship of the Department of Applied Electricity at Pratt Institute, Brooklyn, N. Y.

MR. FREDERICK M. ROSSELAND, the genial secretary of the Electric Club, of Chicago, was married to Miss Editha Farnsworth on September 15, at Algonac, Mich., the summer home of the parents of Miss Farnsworth.

MR. WILLIAM S. ALDRICH, of the United States Reclamation Service, has been appointed acting professor of electrical and mechanical engineering at the University of Arizona during the sabbatical leave of absence of PROFESSOR W. W. HENLEY.

MESSRS. D. C. AND WILLIAM B. JACKSON, engineers, Chicago and Boston, announce the removal of their Boston office from 84 State Street to 248 Boylston Street. They also announce the appointment of MR. EDWARD L. MORELAND as manager of the Boston office.

MR. F. L. DAME, recently vice-president of the Electric Bond & Share Company and the American Power & Light Company, and MR. ALLEN THORNDIKE, of Jackson & Curtis, Boston, have been elected directors of the Central States Electric Corporation.

DR. JOHN PRICE JACKSON, dean of the Pennsylvania State College, has received a leave of absence to permit him to take up his duties as Commissioner of Labor and Industry of the State of Pennsylvania, with headquarters at Harrisburg. This is a new department, and Dr. Jackson will have the duty of organizing it.

MR. F. X. CLEARY, for a number of years connected with the New York office of the Western Electric Company but who, for the last year or two, has been engaged in the advertising business, has accepted a position with the George Cutter Company of South Bend, Ind. Mr. Cleary will be at South Bend for a number of months, after which it is expected he will take charge of the eastern territory with headquarters in New York.

MR. GUY E. TRIPP, chairman of the board of directors of the Westinghouse Electric & Manufacturing Company, has returned to this country from a five weeks' trip to Europe. Mr. Tripp has been looking over the subsidiary interests of the Westinghouse Company abroad. It is understood that all of these companies are in very good shape, with orders booked several months ahead. The British company is making a good profit, and is expecting to declare an initial dividend on its stock.

OBITUARY.

MR. REUBEN C. WINCHESTER, treasurer of the Holyoke (Mass.) Water-Power Company, died in that city, September 10. Mr. Winchester was selected to the position which he held, in 1902, and had to do with the finances of the company's electric power plant as well as those of the water-power business. At the funeral, held September 13, President Gross of the company paid a high tribute to the ability and character of the deceased.

DR. ALEXANDER MACFARLANE, of wide prominence and reputation as an educator and in mathematical and physical research, died at his home in Chatham, Ontario, on August 28. Dr. Macfarlane was born at Blairgowrie, Scotland, April 21, 1851. He entered the University of Edinburgh in 1869, winning many scholarships. In 1875, he finished an extensive course in undergraduate study, taking the degree of Master of Arts, with honors in mathematics and physics. After graduation he won the MacLaren Fellowship, and in 1878 obtained the degree of Doctor of Science. His thesis at this time was upon an experimental research into the conditions governing the electric spark. This brought him to the attention of Clerk Maxwell, from whom he received many enconiums of praise. In 1879 he was elected to the Royal Society of Edinburgh. He was called to the chair of Physics at the University of Texas in 1885, and in 1887 received the honorary degree of LL.D. from the University of Michigan. In 1891 he was actively engaged in organizing the Texas Academy of Science, and for two years acted as its honorary secretary. Dr. Macfarlane moved to Canada about 15 years ago. He has been actively engaged in mathematical research, and has been a prolific contributor to the proceedings of the learned societies and the technical press.

PROPOSALS.

FIRE-ALARM BOXES. — Sealed proposals will be received by Charles W. Stage, Director of Public Safety, Cleveland, O., until September 22, for furnishing fire-alarm boxes for the Fire Department.

FIRE-ALARM BOXES. — Sealed bids will be received until September 25, for 10 or more fire-alarm boxes for the Cincinnati Fire Alarm Telegraph Department. Address Stephen W. McGrath, City Purchasing Agent.

LIGHTING FIXTURES.—The City Council of Portland, Ore., will receive bids until October 6 for the installation of lighting fixtures for the new jail, nearing completion. Plans and proposal blanks are obtainable from the architects, Emil Schacht & Sons, Commonwealth Building.

ELECTRIC LIGHT PLANT, ETC. —Sealed proposals will be received until October 20 for the construction of an electric light plant at Longview, Tex., estimated to cost $110,000. Plans and specifications may be obtained from the Aetna Engineering Bureau, 17 North LaSalle Street, Chicago, Ill.

ELECTRICAL EQUIPMENT. — Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until October 7, for furnishing and erecting a three-ton two-motor electric crane, to be delivered at the Navy Yard, Brooklyn, N. Y., as per Schedule 5,848; also a portable electrically driven deck winch, complete, for delivery at the Navy Yard, Brooklyn, N. Y., as per Schedule 5,847.

INTERIOR LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until October 21 for the construction, including lighting fixtures of a one-story building for the post office at Ansonia, Conn.; and until October 24 of a one-story building for the post office at Casper, Wyo., in accordance with drawings and specifications, which may be obtained from the custodians of the sites or from the Supervising Architect.

FOREIGN TRADE OPPORTUNITY.

(Where addresses are omitted they may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C. In applying for addresses refer to file number.)

No. 11,616. TELEGRAPH POLES, BRONZE WIRE, BRONZE, AND INSULATORS.—The American consulate general at Tangier, Morocco, has forwarded copies of specifications covering contracts open to public tenders for the following articles; 6,000 telegraph poles, 177,600 kilos of silician or phosphor bronze wire, 20,000 kilos of silician bronze with high breaking strain, and 100,000 insulators on brackets. Contracts will be awarded October 13.

NEW INCORPORATIONS.

MARSEILLES, ILL.—The Consumers Water & Light Company has been incorporated with a capital stock of $50,000 by W. S. Carnahan, H. J. Vance and others.

GALESBURG, ILL.—The Galesburg Railway, Light & Power Company has been incorporated with a capital stock of $50,000 by E. W. Fowler, H. J. Vance and others.

MINERAL WELLS, TEX. — Mineral Wells Electric Company has been incorporated with a capital stock of $65,000 by Percy Jones, W. E. Kaufman and D. T. Bemar.

LOCUST GROVE, OKLA.—Cherokee Light & Fuel Company has been incorporated with a capital stock of $15,000 by E. E. Atherton, J. M. Conner and E. R. Wilson.

PITTSBURGH, PA.—Live Wire Electric Company has been incorporated with a capital stock of $5,000. The incorporators are C. C. Canfield, W. S. Wallace and L. W. Huggins.

PITTSBURGH, PA. — Wayman-Aikeen Electric & Manufacturing Company has been incorporated with a capital stock of $6,000. The incorporators are T. A. Wayman, G. A. Aiken and G. E. Wayman.

PITTSBURGH, PA.—Hovey Electric Company has been incorporated with a capital stock of $5,000 to engage in electric wiring. The incorporators are A. C. Hovey, C. J. Winkler and B. C. Timmsen.

CHICAGO, ILL.—Kimberly Manufacturing Company has been incorporated with a capital stock of $2,500 to deal in electrical appliances. The incorporators are Robert B. Clark, W. H. Beckman and Edgar J. Phillips.

MARION, IND. — Delta Electric Company has been incorporated with a capital stock of $25,000 to deal in electrical goods. The directors are J. W. Stephenson, W. B. Stephenson, S. H. Smith, A. E. Case, J. J. Brownrigg and H. Henderson.

CHICAGO, ILL.—Petschel Storage Battery Company has been incorporated with a capital stock of $75,000 for the purpose of manufacturing electrical supplies. The incorporators are H. T. Scarrett, N. E. Cole and R. T. Jefferson, Chicago, Ill.

GALESBURG, ILL.—Galesburg Railway, Lighting & Power Company has been incorporated with a capital stock of $50,000 and will operate a general lighting and power business. W. H. Carpahan, H. J. Vance and E. W. Fowler are named as the incorporators.

NEW PUBLICATIONS.

FIRE PREVENTION.—The National Fire Protection Association, 87 Milk Street, Boston, Mass., has issued a pamphlet containing suggested programs for guidance in the observation of Fire Protection Day. This comprises exercises for evening assemblies, schools and public parades.

LIGHT AND ILLUMINATION.—The Illuminating Engineering Society of London has reprinted a few general recommendations on lighting which appeared originally in the *Illuminating Engineer* in December, 1912, under the title "Light and Illumination; Their Use and Misuse." This publication is somewhat similar to the Primer on Illumination published by the Illuminating Engineering Society in this country. Copies can be obtained from the *Illuminating Engineer,* 32 Victoria Street, London, S. W.

MINNESOTA COMMISSION.—The Railroad and Warehouse Commission of Minnesota has issued its twenty-eighth annual report, for the year ending November 30, 1912. This contains a statement of the work of the Commission during the year, a summary and comparison of returns of all railroad companies in the state, report of engineering department, report of department of weights and measures, list of complaints, opinions of the attorney-general, reports of express companies and suburban electric railways and a number of statistical tables.

DATES AHEAD.

Illuminating Engineering Society. Annual convention, Pittsburgh, Pa., September 22-26.

Association of Iron and Steel Electrical Engineers. Annual meeting, New York, N. Y., September 22-27.

Indiana Electric Light Association. Annual convention, Indianapolis, Ind., September 24-25.

Illinois State Electric Association. Annual convention, Quincy, Ill., September 24-25.

Colorado Electrical and Industrial Exposition, Auditorium, Denver, Colo., October 4-11.

Colorado Electric Light, Power and Railway Association. Eleventh annual convention, Denver, Colo., October 6.

Colorado Electrical Club Show. Denver, Colo., October 8-15.

Kansas Gas, Water, Electric Light and Street Railway Association. Annual convention, Hutchinson, Kans., October 9-11.

American Electric Railway Association. Annual convention, Atlantic City, N. J., October 13-17.

Jovian Order. Annual Convention, Hotel Astor, New York, N. Y., October 14-16.

Railway Signal Association. Annual convention, Nashville, Tenn., October 14-17.

Telephone Pioneers of America. Annual meeting, Chicago, Ill., October 16-17.

Electrical Exposition and Motor Show of 1913. New Grand Central Palace, New York, N. Y., October 15-25.

American Mining Congress. First national mining show, Horticultural Hall, Philadelphia, Pa., October 17-25.

Association of Railway Electrical Engineers. Annual convention, Hotel La Salle, Chicago, Ill. October 20-24.

Electric Vehicle Association of America. Annual convention, Hotel La Salle, Chicago, Ill., October 27-28.

With the Electrical Manufacturers

Edson O. Sessions, Marquette Building, Chicago, has sent out circular letters to his friends calling attention to his establishment of a consulting engineering office and the facilities he has for supplying dependable engineering service along the lines of mechanical electrical and industrial betterments of every kind.

The Brown Instrument Company, Philadelphia, Pa., has issued in the form of a 16-page pamphlet a copy of a letter which it recently sent to various users of some 4,000 Brown electric pyrometers; the replies from about 100 of these users are included, all of them praising the instrument highly.

J. H. Parker & Sons, 17 Highland Street, Chelsea, Mass., have issued a new 40-page catalog of porcelain insulating materials. Among the products listed are knobs, cleats, bushings, switch bases, insulators, etc., prepared on the dry process; also tubes, insulators and insulating specialties prepared on the wet process. The catalog is copiously illustrated and gives full data of each piece listed.

The Chicago Rawhide Manufacturing Company, 1301 Elston Avenue, Chicago, Ill., has issued a new catalog of its mechanical leather goods which contains 88 pages replete with illustrations, descriptions and data of the company's belting, lacing, straps, packings, friction materials and rawhide gears. There is also included a special section devoted to automobile and motorcycle specialties of various kinds prepared from rawhide.

Harrison Safety Boiler Works, Philadelphia, Pa., is sending out circular letters calling attention to the advantages of the Sorge-Cochrane hot-process system of water softening. This is a system combining a boiler feed-water heater and an apparatus for chemically treating the water. The circular points out particularly that a hot process is more effective than one in which the feed water is chemically treated first and then heated. This system is said to be suitable for various kinds of water, since the chemical process can be adapted to the character of the hardness found in any particular samples.

General Insulate Company, 1008-1014 Atlantic Avenue, Brooklyn, N. Y., has recently appointed the Wm. J. McKenna Company, South Clinton Street, Chicago, as its Middle States representatives in place of A. J. Cox & Company, who formerly represented the General Insulate Company in that territory. Ohio, Michigan and Indiana will be covered hereafter by Ralph S. Mueller, 423 High Avenue, Cleveland, Ohio, as heretofore. The General Insulate Company has also recently established a Pacific Coast agency, being represented in that section by H. R. Dalitz, 622 First Avenue, West, Seattle, Wash.

National X-Ray Reflector Company, Chicago, Ill., has issued a reprint from the *Fine Arts Journal* of an article entitled "The Lighting of the Home," by Evelyn Marie Stuart. This article is attractively illustrated and points out the artistic as well as the excellent illuminating value of indirect lighting equipment. The last few pages of the pamphlet are devoted to a manufacturer's description of the Eye-Comfort system of indirect lighting together with typical fixtures suitable for the illumination of various rooms in the home.

The American Conduit Manufacturing Company, Pittsburgh, Pa., has issued a pamphlet devoted to Galvanite rigid conduit. This material is electrolytically coated with zinc instead of having merely an ordinary galvanized protection. The pipe used is standard spellerized steel pipe, which is a mild-steel tubing of great uniformity. The pamphlet explains the details of the process of manufacture and points out important advantages brought about by the special methods followed. Details are also given of American enameled conduit. Many valuable data and tables are included, together with a partial list of notable installations making use of these conduits.

The United States Light & Heating Company, New York City and Niagara Falls, N. Y., has issued bulletin No. 110. This is entitled "Independent Electric-Light Low-Voltage Isolated Plants," and includes 40 pages of descriptive and illustrated matter describing the advantages of 32-volt plants for country installations and such places as are inaccessible to central-station circuits. These plants are almost invariably provided with a storage battery, either as one of the main features of the equipment or at least as an auxiliary. The bulletin points out the peculiar advantages of the company's U. S. L. storage batteries for this service. Lists of several types of complete equipment are given. General directions for the operation of the plant and care of the battery, together with diagrams of the circuit layout are also given.

The Mechanical Appliance Company, Milwaukee, Wis., manufacturer of Watson motors, has moved its Chicago office from the Fisher Building to room 740, Webster Building. J. A. Adamson, formerly manager of this branch, has resigned and H. A. Barrett, formerly of the Electric Appliance Company and of the Jenney Electric Company, has been appointed manager of the Chicago office. The Mechanical Appliance Company has just issued a 32-page booklet entitled "Some Installations of Watson Motors." This contains complete descriptions and illustrations of various kinds of motor-driven plants and gives information concerning the motor equipment for different types of machinery. Tabulated data of sizes and capacities of motors are also included: nearly five pages are devoted to the motor equipment data.

The Kuhlman Electric Company, Elkhart, Ind., has published bulletin No. 28, describing and illustrating high-voltage, outdoor-type transformers. With this type of transformer it has been practically demonstrated that the outdoor substation has come to stay. Highly satisfactory waterproof protective devices have been perfected, and terminal outlet bushings having insulation strength equal to line insulators have been designed. Special precaution has been taken to have all parts substantially secured so as to provide ample space-factor throughout, eliminating mechanical displacements of parts, and developing a structure of such rigidity that it will operate satisfactorily under the most violent electrical and mechanical strains caused by switching surges or static disturbances of any kind. Copies of this bulletin will be sent to all of those interested upon receipt of request.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued a new number of the "Textile Quarterly," a publication issued every three months devoted to the use of electricity in the textile industry. The cover is a unique reproduction of a piece of linen; this particular issue is devoted to motor drive in the silk industry and a number of interesting motor applications are shown. "Selecting Motor Equipment for Electrically Operated Hoists" is the title of a bulletin (section 3113) just issued by the Industrial & Power Department of the company; this pamphlet gives a lot of interesting data and information on the subject of hoisting equipment: a number of formulas applying to this work are given together with examples; diagrams of connections of different systems are also given, and the bulletin has a question sheet for securing data on installations of this kind. Descriptive leaflet No. 3,551 just issued by the company describes alternating-current magnetic switches known as the type F; these are designed to withstand the severest forms of industrial service. Descriptive leaflet No. 3,698 covers motors for driving intertype and linotype machines; the characteristics necessary for this service are explained, and application views shown of motors installed for driving these machines.

Record of Electrical Patents.

Issued by the United States Patent Office, September 9, 1913.

1,072,413 and 1,072,414. Refractory Material. W. Arthur, assignor to General Electric Co. A soft, flabby product made by heating a mixture of silica, carbon and titania in an eletcric arc and condensing the resulting vapor in an inert environment.

1,072,422. Electric Controlling Apparatus. J. Burke, assignor to Burke Electric Co., Erie, Pa. For connecting a motor across the whole or part of the windings of a star-connected transformer.

1,072,426. Indicating Device. C. R. B. Claflin, assignor to Atlantic National Bank, Providence, R. I. Consists of a number of groups of signaling devices, each comprising electric lamps provided with a screen to form a characteristic image and means for directing the images upon the same spot on a suitable background.

1,072,440. Motor-Control System. G. T. Eagar, assignor to General Electric Co. Includes contactors and a time-limit relay for automatically accelerating the motor step by step.

1,072,443. Vapor Electric Apparatus. S. Ferguson, assignor to General Electric Co. Includes automatic means for changing the number of rectifiers in accordance with the direct-current load.

1,072,445. Alternating-Current-Motor Control. V. A. Fynn, assignor to Wagner Electric Mfg. Co., St. Louis, Mo. Includes a single-phase motor and means dependent upon its speed for generating a number of E. M. F.'s of different phase for a polyphase relay controlling a switch that changes the motor circuits.

1,072,459. Substation Selective Apparatus. O. B. Hjorth, Sandwich, Ill. Relay-controlled signaling through a step-by-step selector.

1,072,460. Plug-Socket Electrical Connector. W. F. Hoffmann, assignor to American Electrical Heater Co., Detroit, Mich. A flatiron socket with spring arranged to eject the plug when the contacts are uncoupled.

1,072,462. Outlet Box. W. H. Hope, Newark, N. J. Has cable-clamping means adjacent to the knockouts.

1,072,474. Automatic Electric Recording Device. A. Lambot, Brussels, Belgium. A transmitter has a rotary tongue carrying a circuit-closing needle.

1,072,478. Method of Protecting Conduits for Electric Conductors. G. A. Lutz, assignor to American Circular Loom Co., Portland, Me. The conduit is electroplated inside and outside and at the same time the plating is caused to flow to fill any bare spots.

1,072,507. Valve or the Like. O. A. Ross, Chicago, Ill., assignor of one-half to C. V. Kasson. Includes electrically controlled means for normally keeping the valve in operative position.

1,072,511. Dynamo-Electric Apparatus for Firing Mines. K. Schaffler, rekte Glössl, Vienna, Austria-Hungary. A Spring-driven blast-firing dynamo.

1,072,513. Attachment for Telephone Transmitters. E. M. Schollenberger, Chicago, Ill., assignor of one-half to L. A. Stahl. A nearly closed chamber closely fitting the mouth is placed over the mouthpiece to confine the sound.

1,072,523 and 1,072,524. Insulator. L. Steinberger, Brooklyn, N. Y. The first patent provides for a quick-release binding-post to facilitate disconnection when the cover is removed. The second patent covers the construction of a rain shield and special bail for a suspension insulator.

1,072,525. Suspension Insulator. L. Steinberger. Has alternate horizontal and vertical units.

1,072,530. Electric Heater. E. Thomson, assignor to General Electric Co. A heat-storage cooker heated by an electric arc whose energy is regulated according to temperature.

1,072,531. Electrical Measuring Instrument. R. L. Triplett, assignor to Diller Mfg. Co., Bluffton, O. A combined voltmeter and ammeter.

1,072,537. Individual Telephone-Mouthpiece. C. S. Warren, Milford, O. A band carrying several individual mouthpieces can be placed over the transmitter.

1,072,540. Contact Device. J. J. H. W. Weenen, Amsterdam, Netherlands, assignor of one-third to K. W. G. J. Stoffels and one-third to J. B. Van Der Sprenkel. For electrically operated point of signal-controlling apparatus for tramways.

1,072,551. Electric Battery. D. H. Wilson, Chicago, Ill. Has two carbon electrodes whose ends project through openings in the cell and are connected together by bolts.

1,072,561. Terminal Connector for Spark Plugs. C. W. Beck, assignor to Michigan Motor Specialties Co., Detroit, Mich. Covers details.

1,072,563. Insulated Rail-Joint. J. A. Bodkin, New York, N. Y. Has a pair of co-operating splice bars insulated from the web of the rail and each consisting of a U-shaped bolt.

1,072,567. Electric Signaling on Railways. H. Brown, Belfast, Ireland. Has a number of signal devices on the cab and groups of signal-controlling bars along the track.

1,072,595. Heater for Automobile Radiators. W. Gallaher, St. Louis, Mo. Includes an electric heating element.

1,072,614. Method of Electrically Welding Chain Links. W. H. Hodges, assignor to Thomson Electric Welding Co., Lynn, Mass. For butt welding the free ends of a link.

1,072,617. Laundry Machinery. L. Judelson, New York, N. Y. A drying cabinet with motor-driven blower and conveyor.

1,072,625. Attachment for Electric Chandeliers. H. Leik, Seattle, Wash. A two-part outlet box (to the lower part of which the electrolier is fastened) is secured to and within a header block.

1,072,634. Electric Safety-Razor. S. W. Moon, Chicago, Ill. In the handle

is an electromagnet, armature and circuit-breaker arranged to impart vibrations of the armature to the razor frame.

1,072,647. Dynamo-Electric Machine. A. A. Pifer, assignor to Cleveland Armature Works, Cleveland, O. Each pole has a pair of shiftable pole-shoe sections, all of which are simultaneously adjustable, toward or away from each other.

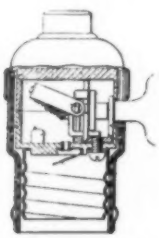
1,072,656. Motor-Control System. G. B. Schley, assignor to Allis-Chalmers Co. Motor-generator set with automatic switches and regulating means to prevent excess current in the motor circuit.

1,072,685. Vaporizer. G. A. Arnold, Middletown, Conn., assignor to Arnold Electric Co. Contains electric heating coils.

1,072,742. Tool for Attaching Aerial Cable-Hangers to Their Supporting-Wires. J. C. Kortick, San Francisco, Cal. A modified pliers.

1,072,748. Electrically Heated Boiler. J. F. McElroy Albany, N. Y., assignor to Consolidated Car Heating Co. An air flue open at both ends contains a tubular metallic heating element.

1,072,837. Electrically Driven Can-Tester. C. Downing, assignor to American Can Co., New York, N. Y. Includes a reversing motor and three-position switch.



1,072,898.—Socket Key.

1,072,847. Buffer. D. D. Gordon, assignor of one-half to Reliable Electric Co., Chicago, Ill. A compact portable motor-driven device.

1,072,890. Perforation Device for Wall-Paper. S. E. Whisner, Verona, Pa. Electromagnetically operated.

1,072,898. Electric Switch. E. Anderson, assignor to Bryant Electric Co., Bridgeport, Conn. Lamp-socket switch with spring-controlled oscillating switch piece. (See cut.)

1,072,913. Change-Speed Gear. A. T. Collier, St. Albans, England. Includes an electromagnetic clutch.

1,072,926. Electric-Lamp Fixture. G. J. Dormandy, assignor of one-half to United Shirt & Collar Co., Troy, N. Y. Longitudinally and angularly adjustable lamp-carrying arms are swiveled in brackets on top of an outlet box supported on a standard.

1,072,938. Shut-Off System for Conduits. I. Gillen, Woodmere, N. Y. Includes a gas valve normally held open against the force of a spring, an electromagnet adapted to release the valve and a circuit-closer affected by heat to close the magnet circuit. (See cut.)

1,072,945. Electrochemical Process. J. L. R. Hayden, assignor to General Electric Co. Consists in producing a chemical change in gases by passing them through a low-temperature mercury arc.

1,072,961. Igniter. G. B. Lambert, New York, N. Y. Electric igniter for a gas lamp.

1,072,973. Timer. W. F. Minor, New York, N. Y. A clock-controlled timer for electrically operated counting signals.

1,072,996. Electric Lock-Strike. F. F. Schneider, Ridgefield, Conn. Electrically operated means to normally hold the latch against movement.

1,072,999. Tubular Insulator. G. Simcoe, Trenton, N. J. Has two longitudinal holes connected with an opening for a supporting loop.

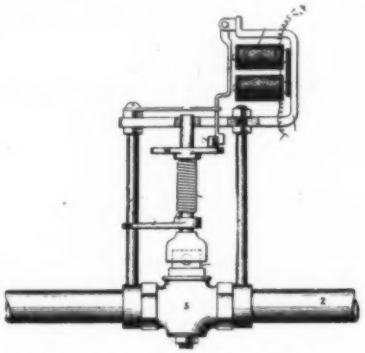
1,073,014. Hair-Waver. E. Andrews and H. P. Andrews, Portland, Oreg. Contains electric heating coils.

1,073,018. Signaling and Telephone System for Railroads. W. J. Bailey, Cedarville, W. Va. For communicating with a moving train.

1,073,020. Magneto. P. Beck, Alexandria, Ind. For ignition purposes.

1,073,023. Electric Switch. J. M. Blain, Spring City, Utah. A three-point switch.

1,073,024. Electrical Signaling Device. C. L. Bopp, Waterloo, Iowa. The signal circuit is closed by the depression of the track rail.



1,072,938.—Electric Gas-Shutoff.

1,073,029. Insect-Exterminator. F. Doney, Colfax, Wash., assignor of one-half to W. T. Smith. Consists of closely adjacent channels containing liquid, alternate channels being connected to opposite sides of an electric circuit.

1,073,043. Spark Plug. E. C. Henn, Cleveland, O. One electrode is spirally arranged around the projecting end of the other.

1,073,044. Electric Attachment for Keyboards of Autoplayers. O. Herrmann, New York, N. Y. A series of tuned electric bells.

1,073,047. Electric Switch. M. L. Hubermann, Los Angeles, Cal. Has automatic operating means governed by a tank float and its counterweight through a rock arm and spring. (See cut.)

1,073,059. Method of Making Coils. R. Varley, assignor to Varley Duplex Magnet Co., Jersey City, N. J. Provides for feeding a continuous binder to the coil formers and in contact with the wires during the winding.

1,073,060. Electric Coil. R. Varley, assignor to Varley Duplex Magnet Co. Has angular openings forming corners and comprising superposed layers of winding with the turns of one layer staggered with the adjoining turns of another layer.

Reissue.

13,613. Process for Reclaiming Vulcnized Rubber Waste. C. S. Heller, assignor to Moore Architectural & Engineering Co., Akron, O. Original No. 978,584, dated Dec. 13, 1910. Consists in subjecting the waste to the action of a solution of caustic alkali and ferric sulphate, heating the solution and subjecting it to pressure, agitation and to an electric current.

Patents That Have Expired.

Following is a list of electrical patents (issued by the United States Patent Office) that expired September 15, 1913.

567,586. Dynamo-Electric Machine. G. E. Dorman, Chicago, Ill.

567,599. Electric Cutout and Annunciator. J. Kips, New York, N. Y.

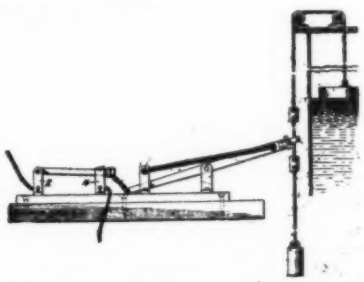
567,608. Automatic Cutout. H. F. Parshall, London, England.

567,619. Electromagnetic Pin-Extractor Attachment for Cloth-Finishing Machines. A. C. Shuttleworth, Philadelphia, Pa.

567,651. Automatic Regulator for Electric Motors. H. P. Merriam, New York, N. Y.

567,662. Electric Locomotive. S. H. Short, Clevelnd, O.

567,688. Telephone. R. F. Rankin, Philadelphia, Pa.



1,072,847.—Automatic Yank Switch.

567,691. Electric Arc Lamp. P. R. Salberg, Allegheny, Pa.

567,699. Electric Smelting Furnace. J. A. Vincent, Philadelphia, Pa.

567,705. Mold for Battery Plates. C. G. Fawkes, Denver, Colo.

567,714. Regulating Admission of Current to Motors. F. E. Herdman, Winnetka, Ill.

567,719. Dynamo-Electric Machine. H. W. Libbey, Boston, Mass.

567,721. Method of Producing Electricity. J. R. Payson, Jr., Chicago, Ill.

567,746. Armature for Dynamo-Electric Machines. F. J. Haerer and C. L. Gikeleiter, Philadelphia, Pa.

567,753. Railway-Crossing Signal. C. Selden, Baltimore, Md.

567,754. Trolley Contact Device. R. Skeen, Madison, Ill.

567,759. Electric Signal. C. P. Wilkinson, Jackson, Mich.

567,760. Electric Track Signal. C. P. Wilkinson, Jackson, Mich.

567,784. Insulated Cross-Over for Trolley Wires. A. Hanson, Chicago, Ill.

567,816. Electric Contact Device. R. Skeen, Madison, Ill.

567,818. Electrical Condenser. N. Tesla, New York, N. Y.

567,840. Electric Arc Lamp. J. McLaughlin, Chicago, Ill.

567,841. Bond for Electric Railways. J McLaughlin.

567,879. Trolley Guard. F. S. Birth, Philadelphia, Pa.

567,899. Contact Device. F. W. N. E. Hayn, Bahia, Brazil.

567,924. Interchangeable Electric Sign. W. J. Scott and H. W. Shonnard, New York, N. Y.